United States Department of Agriculture

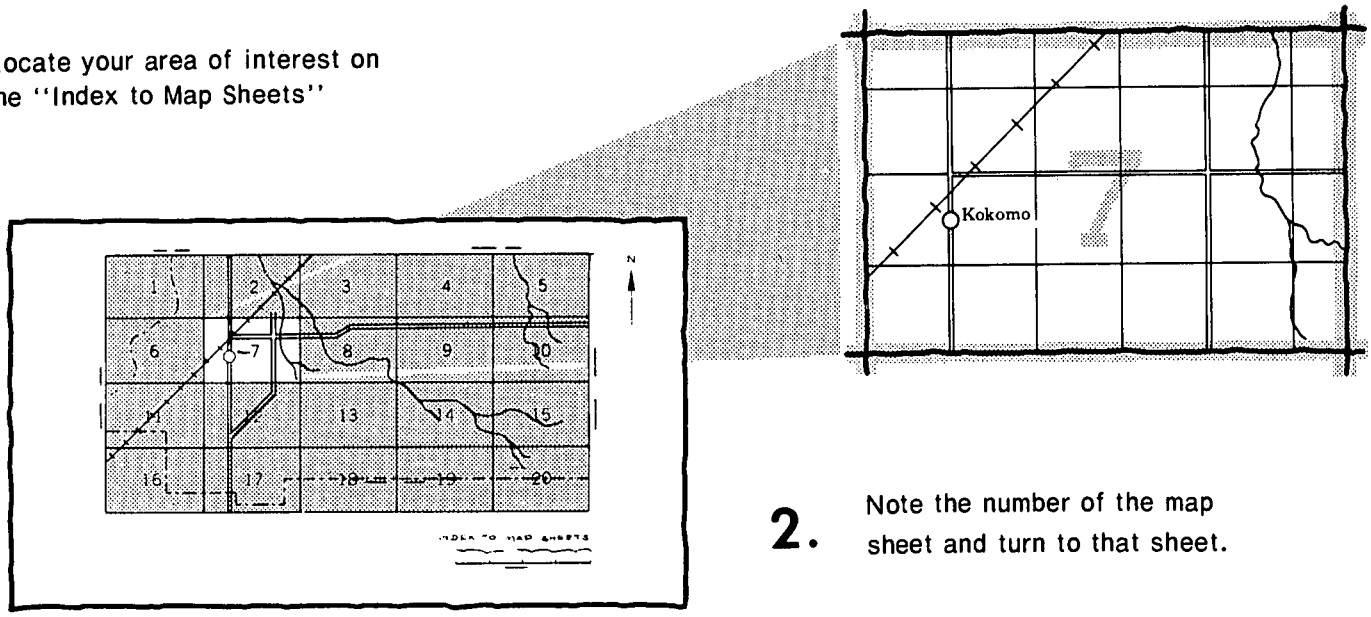
Soil Conservation Service

In cooperation with the United States Department of the Interior, Bureau of Indian Affairs, and the South Dakota Agricultural Experiment Station

Soil Survey of Gregory County, South Dakota

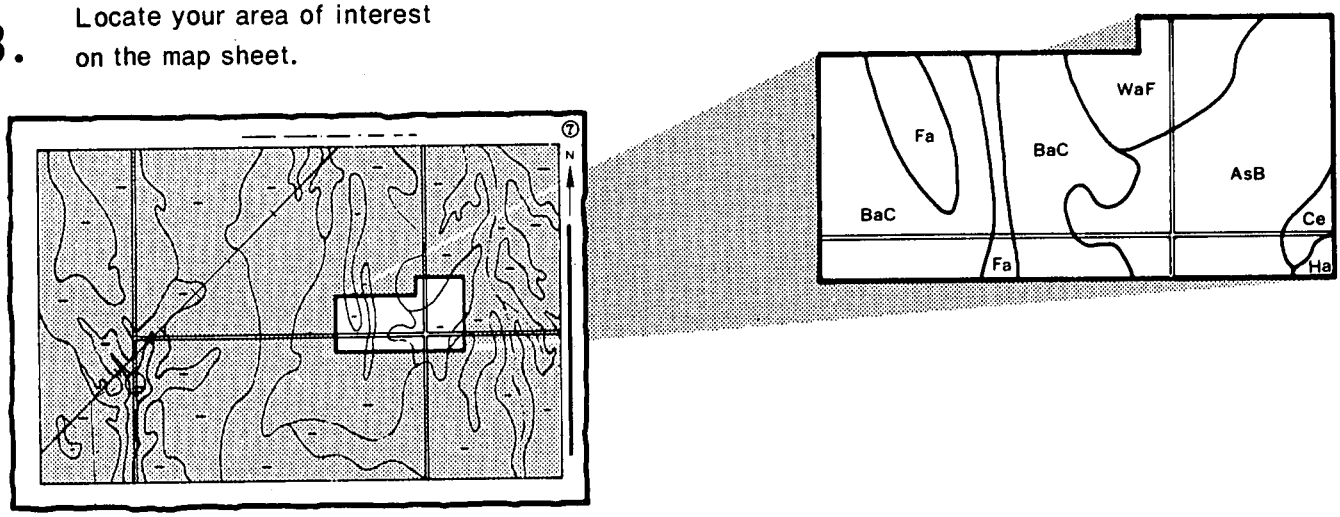
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

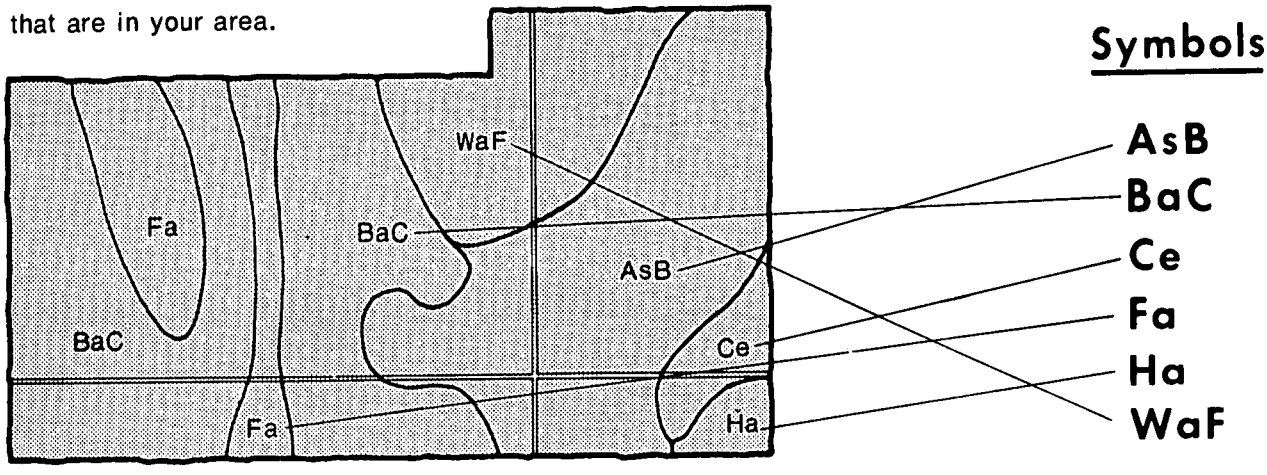


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

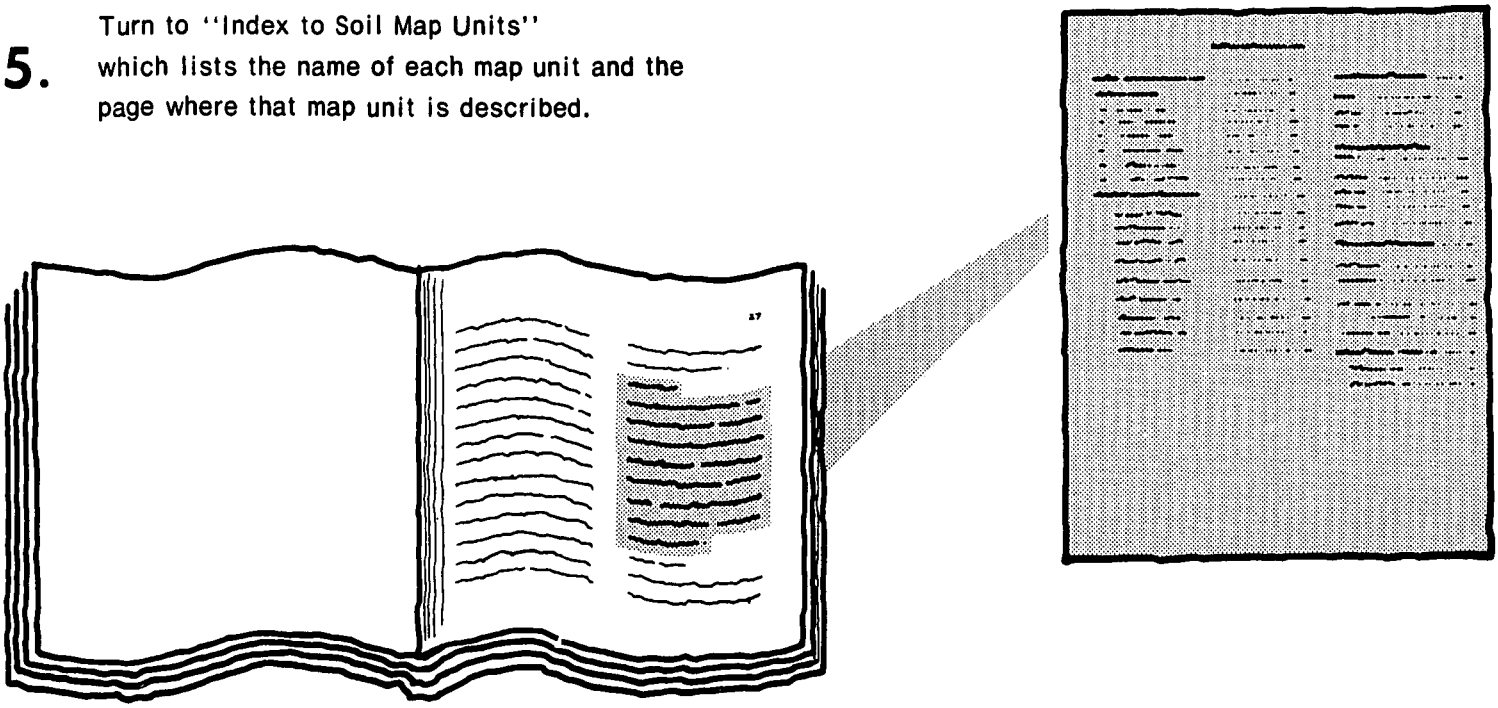


4. List the map unit symbols that are in your area.

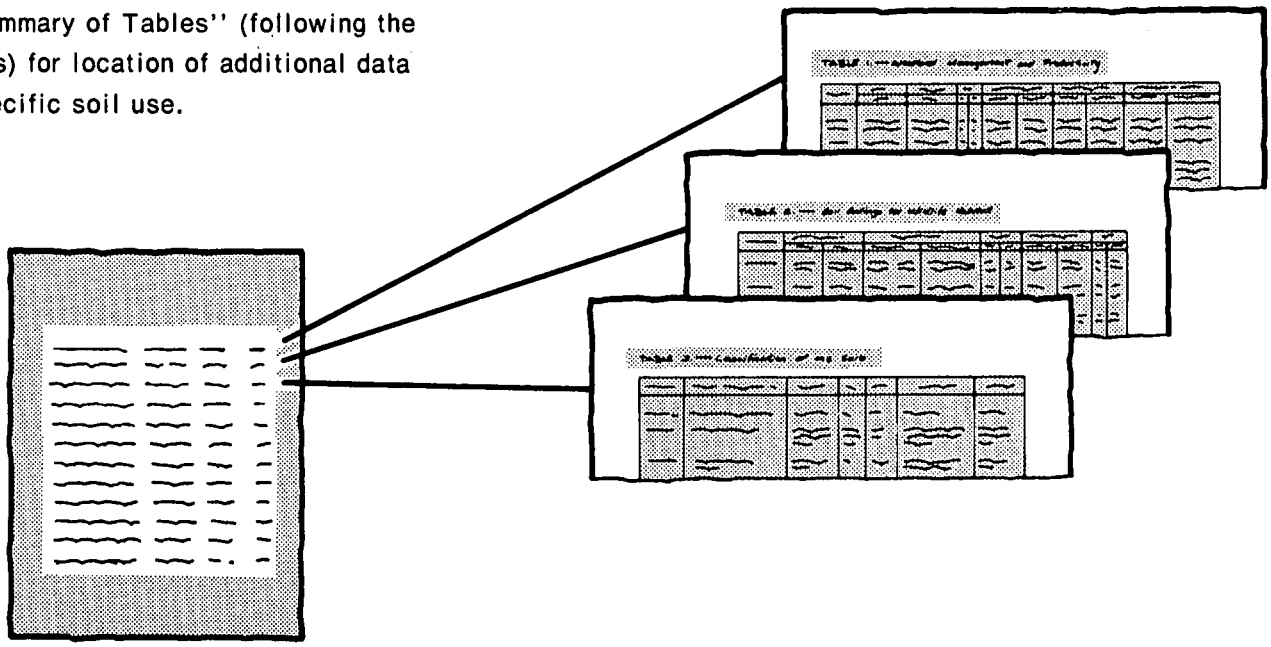


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Gregory County Conservation District. Some financial assistance was furnished by the South Dakota Department of Revenue, the Old West Regional Commission, and the Gregory County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An area of Promise clay, 3 to 6 percent slopes, in the foreground, and an area of Okaton-Marlaville complex, 15 to 50 percent slopes, in the background.

Contents

Soil Series

Issued August 1984

Index to Map Units

Summary of Tables

U.S. DEPARTMENT OF AGRICULTURE

HURON, SOUTH DAKOTA 57350

Soil Survey of Gregory County, South Dakota

ERRATUM

Map Sheet 12 - missing symbol - NW corner of sec. 26 - should be MpB

Map Sheet 22 - missing symbol - center of SW¼ of sec. 26 - should be BlD

Map Sheet 31 - missing symbol - center of sec. 14 - should be Wd

Map Sheet 36 - missing symbol - NW¼ of sec. 33 - should be Cd

Map Sheet 41 - missing symbol - SW¼ of sec. 35 - should be We

Map Sheet 46 - missing symbol - NW¼ of the SW¼ of sec. 10 - should be Dump

Map Sheet 47 - missing symbol - NW¼ of sec. 18 - should be JaC

Map Sheet 52 - missing symbol - center of sec. 20 - should be RaA
missing symbol - SE¼ of the NE¼ of sec. 34 - should be Cd

Map Sheet 54 - missing symbol - SE¼ of sec. 22 - should be ReB

Map Sheet 55 - missing symbol - NW¼ of the SW¼ of sec. 25 - should be MeC

Map Sheet 56 - missing symbol - SW¼ of the SW¼ of sec. 33 - should be Cd

Map Sheet 63 - missing symbol - NW of corner of sec. 11 - should be Mr
missing symbol - SE corner of sec. 18 - should be Bc

Map Sheet 64 - missing symbol - NW¼ of sec. 4 (2 areas) - should be Ia

Map Sheet 65 - missing symbol - NW¼ of the NW¼ of sec. 5 - should be TrE
missing symbol - NE¼ of the NW¼ of sec. 17 - should be Cd

Map Sheet 66 - missing symbol - NW¼ of the NE¼ of sec. 6 - LcF should be MeC
missing symbol - NW¼ of the NE¼ of sec. 6 - should be LcF

Map Sheet 77 - missing symbol - NE¼ of sec. 23 - should be JaB

Foreword

This soil survey contains information that can be used in land-planning programs in Gregory County, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

R. D. Swenson
State Conservationist
Soil Conservation Service

Soil Survey of
Gregory County, South Dakota

By C. Howard Wiesner, Soil Conservation Service

Soils surveyed by Wayne J. Bachman, Thomas G. Groth,
Nilo G. Reber, and C. Howard Wiesner,
Soil Conservation Service,
and James L. Stukel, South Dakota Division of Conservation

United States Department of Agriculture, Soil Conservation Service
In cooperation with the United States Department of the Interior,
Bureau of Indian Affairs,
and the South Dakota Agricultural Experiment Station

GREGORY COUNTY is in the south-central part of South Dakota (fig. 1). It has a total area of 675,885 acres, or about 1,056 square miles, which includes about 22,680 acres of water. About 16,975 acres in the county is Indian Trust land that is administered by the Bureau of Indian Affairs. This land is intermingled with private land throughout the county.

According to the 1980 census, the county has a population of 6,015. Burke, the county seat, has a population of 859; Gregory, the largest town in the county, has one of 1,503; Bonesteel one of 358; and Fairfax one of 225. Other settlements in the county are Dallas, Dixon, Herrick, and St. Charles. Only a few buildings and foundations mark the former villages of Carlock, Lucas, and Paxton.

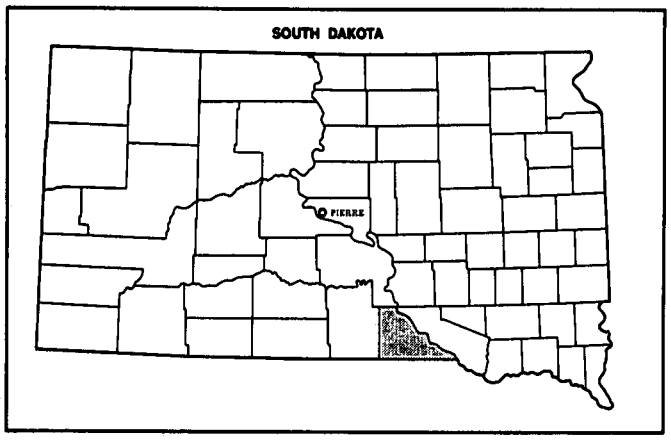


Figure 1.—Location of Gregory County in South Dakota.

General Nature of the County

This section gives general information concerning the county. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Gregory County is usually warm in summer, but hot spells frequently occur and cool days occasionally occur. The county is cold in winter, when arctic air frequently surges over the area. Most of the precipitation falls during the warm period, and rainfall is normally heaviest late in spring and early in summer. The average annual precipitation is as much as 3 inches less in the northwestern part of the county than in the southeastern part. In winter snowfall is blown into drifts, so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gregory, South Dakota, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 23 degrees F, and the average daily minimum temperature is 11

degrees. The lowest temperature on record, which occurred at Gregory on January 29, 1966, is -29 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Gregory on August 3, 1955, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 22.86 inches. Of this, 17 inches, or nearly 75 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 4.20 inches at Gregory on July 1, 1957. Thunderstorms occur on about 40 days each year, and most occur in summer.

The average seasonal snowfall is nearly 50 inches. The greatest snow depth at any one time during the period of record was 29 inches. On an average of 30 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in the spring.

Physiography, Relief, and Drainage

Most of Gregory County is within the Pierre Hills region in the Missouri Plateau section of the Great Plains physiographic province (*3*). The southwestern part, however, is on the loamy Tertiary tableland. The Pierre Hills generally are clayey. They are gently undulating to steep in most areas, but they are hilly to steep in areas along Lake Francis Case. The Tertiary tableland generally is nearly level to moderately steep but is steep in areas of buttes and escarpments. The steep trench of the Missouri River is along the eastern border of the county. Most of the breaks along the river are clayey and are underlain by Pierre shale. The flood plain along the Missouri River is inundated by Lake Francis Case in areas above Fort Randall Dam. A nearly level area, locally called "Herrick Table," is underlain by coarse sandy and gravelly material. It is in the southeastern part of the county.

Bull, Landing, Ponca, Randall, Scalp, and Whetstone Creeks are the major drainageways. All of the drainageways in the county, except for the lower reaches of Ponca Creek, are intermittent. They carry water in the spring and after heavy rains. They all drain into Lake Francis Case or the Missouri River. The Missouri River, which flows south and southeast along the eastern border of the county, has cut a track 2 to 4 miles wide and 300 to 400 feet deep.

Elevation ranges from about 1,250 feet above sea level in the southeastern part of the county to about 2,300 feet above sea level in the southwestern part.

Settlement

Lewis and Clark, traveling up the Missouri River in 1804, passed by what is now Gregory County on their way to examine the land acquired through the Louisiana Purchase. Few permanent settlers resided in Gregory County prior to 1904, which was the year a treaty was negotiated with the Indians and the land was opened for settlement.

Fort Randall, a military outpost, was built in 1856. It occupied a site directly below Fort Randall Dam on the south side of the river. It provided military protection to settlements up and down the river and to trade routes to the west. The fort was abandoned in 1892. Only a cemetery, ruins of a church, and the site of several stables remain.

Gregory County was established in 1862 by the first legislature held in the Dakota Territory. It was not organized, however, until 1896. The county seat originally was Fairfax. It was transferred to Burke in 1916, after a vote by the county residents (*4*).

By 1890, the county had a population of 295. The population reached 13,061 in 1910. It declined to 7,399 by 1960 and 6,015 by 1980.

South Dakota State Highways 43, 44, and 47 and United States Highways 18 and 281 are the main thoroughfares in the county. Most rural areas are served by all-weather roads to centers of trade. A small airport is at Gregory.

Farming

Farming is the principal enterprise in the county. About 82 percent of the farm income is derived from the sale of livestock and livestock products. Many of the crops are used as feed for livestock. In 1978, the 689 farms in the county averaged 1,070 acres in size. The trend is toward fewer and larger farms.

About 53 percent of the acreage in the county is used for cultivated crops or for tame pasture and hay, and about 45 percent is range (*11*). Dryland farming is dominant, but some areas are irrigated. The main cropping system is row crops and small grain grown in rotation with legumes. Corn, grain sorghum, and oats are the main cultivated crops. Wheat and barley are also grown. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the main crops grown for hay. According

to the South Dakota Crop and Livestock Reporting Service, corn was grown on about 43,800 acres in 1980, oats on 50,000 acres, sorghum on 21,400 acres, wheat on 19,300 acres, and barley on 5,300 acres (*5*). The corn from 22,600 acres was harvested for grain. The rest was used for silage. Alfalfa hay was harvested from 69,537 acres in 1978.

Natural Resources

Soil is the most important natural resource in the county. It provides a growing medium for cultivated crops and for the grass grazed by livestock. Other natural resources are ground water, sand and gravel, and wildlife.

Lake Francis Case and the Missouri River are excellent sources of water for domestic and industrial uses and for irrigation. Many small dams, dugouts, and flows of Ponca Creek provide water for livestock in most years. Ground water is available from wells throughout most of the southern part of the county.

Significant deposits of sand and gravel are in areas of the Jansen and Meadin-Jansen associations, which are described under the heading "General Soil Map Units." All of the sand and gravel can be used as subgrade material for roads and as bituminous aggregate. Deposits of fine sand in areas of Meadin soils west of Burke are suitable for the production of cement.

Coyote, cottontail, fox, deer, and upland game birds, such as bobwhite, grouse, prairie chicken, and ring-necked pheasant, are the chief wildlife resources. Bass, bluegill, northern pike, perch, and other fish inhabit most of the permanent water areas. Lake Francis Case and the Missouri River provide excellent camping, fishing, and boating opportunities.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from

year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 12 associations in this county have been grouped for broad interpretive purposes. The associations and the groups are described on the pages that follow. Because of changes or refinements in some series concepts and differences in the design or extent of the map units, the names of the associations do not coincide exactly with those on the general soil maps in the published surveys of Tripp County, South Dakota, and Boyd and Keya Paha Counties, Nebraska.

Soil Descriptions

Nearly Level to Strongly Sloping, Silty and Loamy Soils on Uplands

These soils dominantly are nearly level to moderately sloping but are strongly sloping in places. They make up about 25 percent of the county. About 80 percent of the acreage is cropland. Corn, small grain, grain sorghum, and alfalfa are the main cultivated crops. Some areas are irrigated. Controlling erosion and conserving moisture are the main management concerns.

1. Reliance Association

Deep, well drained, nearly level to strongly sloping, silty soils on uplands

This association is on uplands characterized by long, smooth slopes. The slopes generally are nearly level to moderately sloping but are strongly sloping in places. In most areas the drainage pattern is well defined, but it is poorly defined in areas where small drainageways terminate in small depressions.

This association makes up about 18 percent of the county. It is about 65 percent Reliance soils and 35 percent minor soils.

The Reliance soils have a slope of 0 to 15 percent. Typically, the surface layer is dark grayish brown silty clay loam. The subsoil is dark grayish brown and brown silty clay loam. In the lower part it is calcareous and has spots and streaks of lime. The underlying material is pale brown and brown, calcareous silty clay loam.

Minor in this association are the moderately well drained Bon soils on flood plains, the sodium affected Jerauld and Mosher soils on flats and in slightly concave areas, the clayey Millboro soils on some side slopes, the moderately well drained Onita soils in swales, and the poorly drained Scott soils in depressions.

About 75 percent of this association is cropland. Small grain, corn, grain sorghum, and alfalfa are the main crops. Some areas support native grasses and are used for grazing or hay. Controlling erosion and conserving moisture are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

2. Ree Association

Deep, well drained, nearly level to moderately sloping, loamy soils on uplands

This association is on uplands characterized by smooth slopes. The slopes generally are nearly level or gently sloping but are moderately sloping in places. In most areas the drainage pattern is well defined.

This association makes up about 5 percent of the county. It is about 45 percent Ree soils and 55 percent minor soils.

The Ree soils have a slope of 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown, brown, and pale brown loam and clay loam. The underlying material is very pale brown, calcareous fine sandy loam.

Minor in this association are Anselmo, Holt, Jansen, Lakoma, Millboro, and Tassel soils. Anselmo soils contain more sand throughout than the Ree soils. Holt soils are moderately deep. Jansen soils are 20 to 40

inches deep over coarse sand. Lakoma and Millboro soils are clayey. The shallow Tassel soils are on knolls and ridges. The other minor soils are in positions on the landscape similar to those of the Ree soils.

About 60 percent of this association is cropland. Alfalfa, small grain, and grain sorghum are the main crops. Some areas support native grasses and are used for grazing or hay. Controlling erosion and conserving moisture are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

3. Agar Association

Deep, well drained, nearly level and gently sloping, silty soils on uplands

This association is on uplands characterized by smooth slopes. The drainage pattern is poorly defined in the nearly level areas and well defined in the gently sloping areas.

This association makes up about 2 percent of the county. It is about 45 percent Agar and similar soils and 55 percent minor soils.

The Agar soils have a slope of 0 to 6 percent. Typically, the surface layer is grayish brown silt loam. The subsoil is brown and pale brown silty clay loam. It is calcareous in the lower part. The underlying material is pale brown, calcareous silt loam.

Minor in this association are the calcareous Coly soils on ridges and knolls, the moderately well drained Onita soils in swales, and the poorly drained Scott soils in depressions.

About 90 percent of this association is cropland. Corn, small grain, grain sorghum, and alfalfa are the main crops. Some areas support native grasses and are used for grazing or hay. Controlling erosion and conserving moisture are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

Nearly Level to Steep, Loamy Soils on Uplands

These soils dominantly are nearly level to strongly sloping but are moderately steep and steep in some areas. They make up about 10 percent of the county. About 85 percent of the acreage is range. Alfalfa, small grain, and corn are the main cultivated crops. Controlling erosion is the main management concern.

4. Anselmo-Holt-Tassel Association

Deep to shallow, well drained, nearly level to steep, loamy soils on uplands

This association is on uplands characterized by smooth, gently sloping areas, deeply dissected more sloping areas, and steep buttes. In most areas the drainage pattern is well defined.

This association makes up about 10 percent of the county. It is about 35 percent Anselmo soils, 20 percent Holt soils, 15 percent Tassel soils, and 30 percent minor soils.

The deep Anselmo soils are on the lower side slopes. Slopes range from 2 to 25 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsoil also is grayish brown fine sandy loam. The underlying material is pale brown and light gray fine sandy loam. White, soft, calcareous sandstone is at a depth of about 48 inches.

The moderately deep Holt soils are on flats, ridges, and the upper side slopes. In this association they have a slope of 0 to 9 percent. Typically, the surface layer is dark grayish brown fine sandy loam. The subsoil is dark grayish brown, grayish brown, and light brownish gray fine sandy loam. The underlying material is light brownish gray, calcareous fine sandy loam. White, calcareous sandstone is at a depth of about 30 inches.

The shallow Tassel soils are on ridges and in rimrock areas. Slopes range from 3 to 30 percent. Typically, the surface layer is grayish brown fine sandy loam. The underlying material is light gray fine sandy loam. Pale yellow, calcareous sandstone is at a depth of about 14 inches.

Minor in this association are Dunday, Ree, Valentine, Vetal, Wewela, and Whitelake soils. The sandy Dunday and Valentine soils are in hummocky areas. Ree soils, which contain more clay in the subsoil than the major soils, and Wewela soils, which are underlain by shale, are in positions on the landscape similar to those of the Anselmo and Holt soils. Vetal soils are dark to a depth of more than 20 inches. They are in swales. Whitelake soils have a sodium affected subsoil. They are on flats and in slightly concave areas.

About 85 percent of this association supports native grasses and is used for grazing. Some areas of the Anselmo and Holt soils are cultivated. Alfalfa, small grain, and corn are the main crops. Controlling wind erosion and runoff is the main concern of management. All of the major soils are suited to range and rangeland wildlife habitat. The Anselmo and Holt soils are suited to cultivated crops and tame pasture and hay, but the Tassel soils are unsuited because they are shallow over bedrock.

Nearly Level to Moderately Steep, Loamy Soils Underlain by Sand or Sand and Gravel; on Uplands

These soils dominantly are nearly level to strongly sloping but are moderately steep in some areas. They make up about 12 percent of the county. About 65 percent of the acreage is range. Corn, small grain, alfalfa, and grain sorghum are the main cultivated crops. Some areas are irrigated. Conserving moisture and controlling erosion are the main management concerns.

5. Jansen Association

Well drained, nearly level to moderately sloping, loamy soils that are moderately deep over sand; on uplands

This association is on uplands characterized by gentle rises and slight swales. Slopes dominantly are nearly level or gently sloping but in some areas are moderately sloping. In most areas the drainage pattern is poorly defined.

This association makes up about 6 percent of the county. It is about 55 percent Jansen soils and 45 percent minor soils.

The Jansen soils have a slope of 0 to 9 percent. Typically, the surface layer is grayish brown loam. The subsurface layer is dark grayish brown loam. The subsoil is brown and grayish brown clay loam and pale brown sandy clay loam. The underlying material is multicolored coarse sand.

Minor in this association are Brocksburg, Meadin, O'Neill, Onita, and Ree soils. Brocksburg soils are dark to a depth of more than 20 inches. They are on flats. The excessively drained Meadin soils are on side slopes below the Jansen soils. O'Neill soils, which contain less clay in the subsoil than the Jansen soils, and Ree soils, which do not have coarse sand within a depth of 40 inches, are in positions on the landscape similar to those of the Jansen soils. The moderately well drained Onita soils are in swales.

About 70 percent of this association is cropland. Alfalfa, corn, and small grain are the main crops. Some areas support native grasses and are used for grazing or hay. Controlling erosion and conserving moisture are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

6. Meadin-Jansen Association

Excessively drained and well drained, gently sloping to moderately steep, loamy soils that are shallow or moderately deep over sand and gravel; on uplands

This association is on side slopes of tableland and along drainageways that extend into the tableland. Slopes generally are strongly sloping to moderately steep on the side slopes but are gently sloping or moderately sloping on the tableland. The drainage pattern is well defined.

This association makes up about 6 percent of the county. It is about 55 percent Meadin soils, 20 percent Jansen soils, and 25 percent minor soils (fig. 2).

The Meadin soils are on side slopes. Slopes range from 3 to 25 percent. Typically, the surface and subsurface layers are dark grayish brown sandy loam. The next layer is dark brown loamy sand. The underlying material is multicolored gravelly coarse sand.

The Jansen soils generally are higher on the landscape than the Meadin soils. In this association they have a slope of 3 to 9 percent. Typically, the surface layer is grayish brown loam. The subsurface layer is dark grayish brown loam. The subsoil is brown and grayish brown clay loam and pale brown sandy clay loam. The underlying material is multicolored coarse sand.

Minor in this association are Brocksburg, Labu, Mariaville, O'Neill, and Ree soils. Brocksburg soils are dark to a depth of more than 20 inches. They are in slight swales. The clayey Labu soils and the shallow, loamy Mariaville soils are below the Meadin soils on the landscape. O'Neill and Ree soils are in positions on the landscape similar to those of the Jansen soils. O'Neill soils are 20 to 40 inches deep over sandy material and contain less clay in the subsoil than the Jansen soils. Ree soils are more than 40 inches deep over coarse sand.

About 95 percent of this association supports native grasses and is used for grazing. Controlling erosion is the main concern of management. The major soils are suited to range and rangeland wildlife habitat. They generally are suited to cultivated crops and to tame hay and pasture, but droughtiness is a limitation.

Nearly Level to Strongly Sloping, Clayey Soils on Uplands

These soils dominantly are nearly level to moderately sloping but are strongly sloping in places. They make up about 15 percent of the county. About 60 percent of the acreage is cropland. Grain sorghum, small grain, and alfalfa are the main cultivated crops. Controlling erosion and conserving moisture are the main management concerns.

7. Promise Association

Deep, well drained, nearly level and gently sloping, clayey soils on uplands

This association is on uplands characterized by long, smooth slopes. The drainage pattern is well defined.

This association makes up about 4 percent of the county. It is about 40 percent Promise soils and 60 percent minor soils.

The Promise soils in this association have a slope of 0 to 6 percent. Typically, the surface layer is dark grayish brown clay. The subsoil is dark grayish brown and grayish brown, calcareous clay. The underlying material is grayish brown and light brownish gray, calcareous silty clay.

Minor in this association are the calcareous, light colored Boro and Lakoma soils on ridges; the moderately well drained Carter and Hurley soils in swales; the poorly drained Kolls soils in depressions; the silty Reliance soils on some ridges; the moderately well drained Wendte soils on narrow flood plains; and the moderately well drained Witten soils in swales.

About 70 percent of this association is cropland. Alfalfa, small grain, and grain sorghum are the main crops. Some areas support native grasses and are used

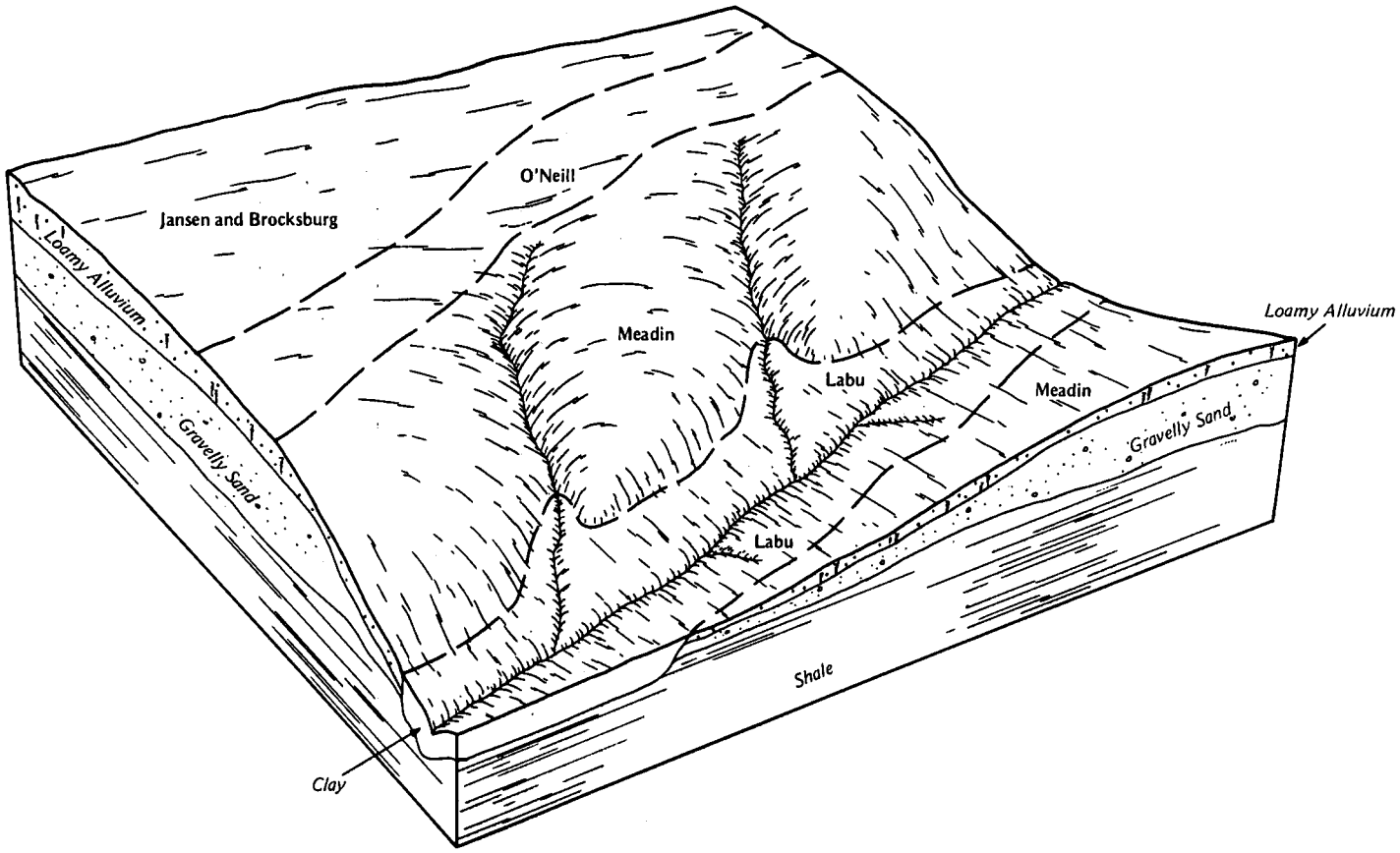


Figure 2.—Pattern of soils and parent material in the Meadin-Jansen association.

for grazing or hay. Controlling erosion, conserving moisture, and improving tilth are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

8. Millboro-Boro Association

Deep, well drained, nearly level to strongly sloping, clayey soils on uplands

This association is on uplands characterized by low ridges and shallow drainageways. Slopes generally are nearly level to moderately sloping but are strongly sloping in some areas. In most areas the drainage pattern is well defined.

This association makes up about 8 percent of the county. It is about 55 percent Millboro and similar soils, 20 percent Boro soils, and 25 percent minor soils (fig. 3).

The Millboro soils are on smooth side slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown silty clay. The subsoil is grayish brown, calcareous clay. The underlying material is grayish brown and light yellowish brown, calcareous silty clay.

The Boro soils are on the ridges. Slopes range from 2 to 15 percent. Typically, the surface layer is grayish brown silty clay. The subsoil is light brownish gray silty clay. The underlying material is light brownish gray and pale yellow silty clay. The soils are calcareous throughout.

Minor in this association are the poorly drained Kolls soils in depressions, the moderately deep Lakoma and silty Reliance soils on some ridges, the moderately well drained Wendte soils on narrow flood plains, and the moderately well drained Witten soils in swales.

About 65 percent of this association is cropland. Small grain, alfalfa, grain sorghum, and corn are the main crops. Some areas support native grasses and are used for grazing or hay. Controlling erosion, conserving moisture, and improving tilth are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

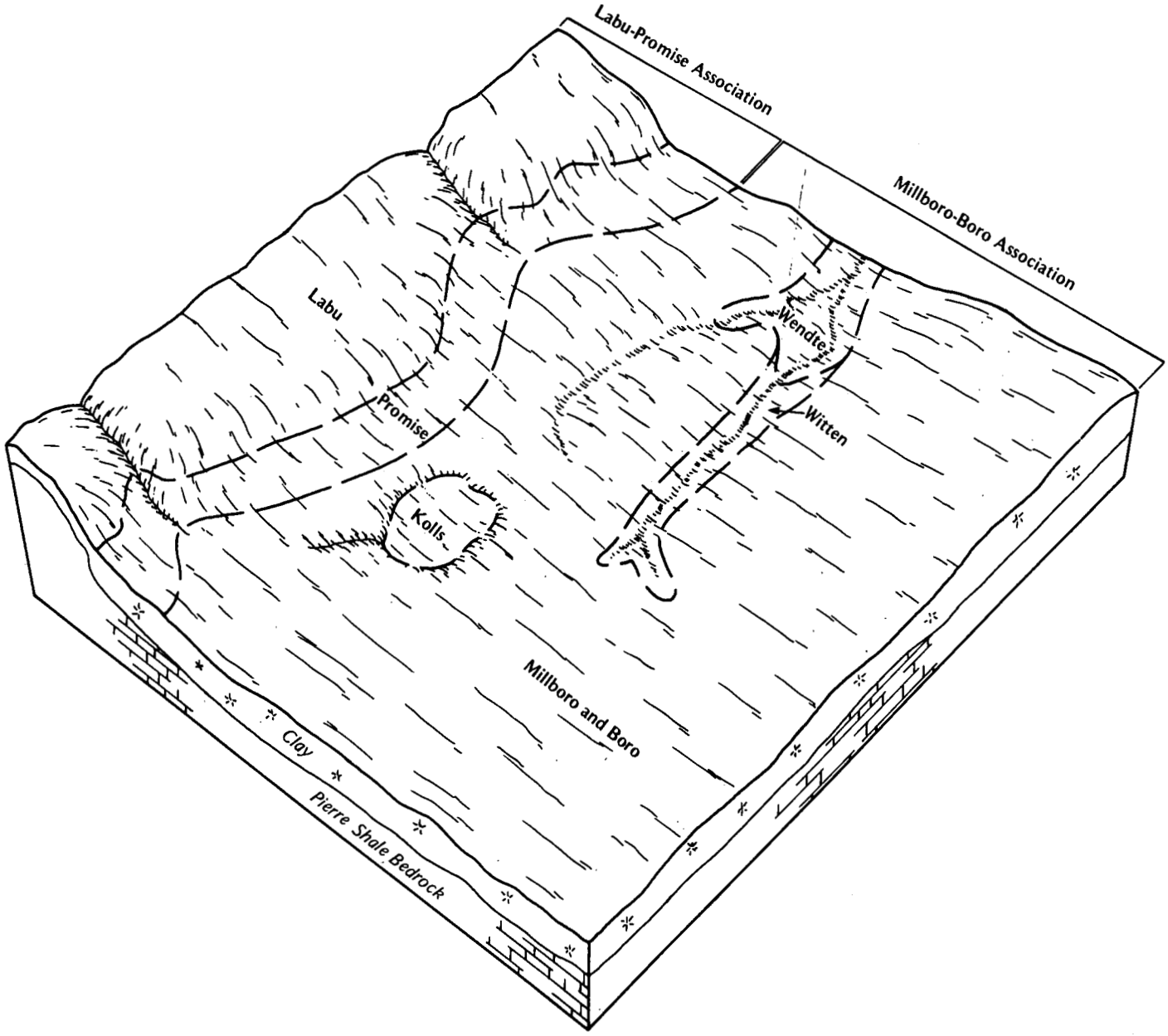


Figure 3.—Pattern of soils and parent material in the Millboro-Boro and Labu-Promise associations.

9. Labu-Promise Association

Moderately deep and deep, well drained, moderately sloping and strongly sloping, clayey soils on uplands

This association is on uplands characterized by low ridges and shallow drainageways. The drainage pattern is well defined.

This association makes up about 3 percent of the county. It is about 50 percent Labu and similar soils, 25 percent Promise soils, and 25 percent minor soils (fig. 3).

The moderately deep Labu soils are on the convex upper parts of the landscape. In this association they have a slope of 6 to 15 percent. Typically, the surface layer and the subsoil are grayish brown clay. The underlying material is light brownish gray very shaly clay.

Light brownish gray shale is at a depth of about 30 inches. The soils are calcareous throughout.

The deep Promise soils are on the smoother parts of the landscape. In this association they have a slope of 6 to 9 percent. Typically, the surface layer is dark grayish brown clay. The subsoil is dark grayish brown and grayish brown, calcareous clay. The underlying material is grayish brown and light brownish gray, calcareous silty clay.

Minor in this association are the silty Reliance soils on some ridges, the shallow Sansarc soils on the steeper slopes, the moderately well drained Wendte soils on narrow flood plains, and the moderately well drained Witten soils in swales.

About 70 percent of this association supports native grasses and is used for grazing or hay. Alfalfa and small grain are the main cultivated crops. Controlling erosion and conserving moisture are the main concerns in managing cultivated areas. The major soils are suited to range, tame pasture and hay, and openland and rangeland wildlife habitat. The Promise soils are suited to cultivated crops, but the Labu soils generally are unsuited because they are too steep.

Strongly Sloping to Very Steep, Clayey and Loamy Soils on Uplands

These soils make up about 37 percent of the county. Nearly all of the acreage is range. Controlling erosion is the main management concern.

10. Labu-Sansarc Association

Moderately deep and shallow, well drained, strongly sloping to very steep, clayey soils on uplands

This association is on breaks along the Missouri River. The landscape is characterized by steep slopes and deeply entrenched drainageways. The soils generally are moderately steep to very steep but are strongly sloping on some side slopes. The drainage pattern is well defined.

This association makes up about 36 percent of the county. It is about 45 percent Labu and similar soils, 40 percent Sansarc and similar soils, and 15 percent minor soils (fig. 4).

The moderately deep Labu soils are on the lower side slopes. In this association they have a slope of 9 to 30 percent. Typically, the surface layer and the subsoil are grayish brown clay. The underlying material is light brownish gray very shaly clay. Light brownish gray shale is at a depth of about 30 inches. The soils are calcareous throughout.

The shallow Sansarc soils are on ridges and the upper side slopes. Slopes range from 9 to 50 percent. Typically, the surface layer is dark grayish brown, calcareous clay. The underlying material is grayish brown and light olive gray, calcareous clay and shaly clay. Light olive gray shale is at a depth of about 18 inches. The soils are calcareous throughout.

Minor in this association are the shallow, loamy Mariaville soils in high rimrock areas; the deep, dark Promise soils on foot slopes; the silty Uly soils on flats adjacent to Lake Francis Case; and the moderately well drained Wendte soils on narrow flood plains.

Nearly all of this association is range. Dense stands of Rocky Mountain juniper and decidious trees grow in many of the draws and on the north-facing slopes. Controlling erosion is the main concern of management. The major soils are suited to range and to rangeland wildlife habitat. They generally are unsuited to cultivated crops and to tame pasture and hay because of the slope. Landslides are common because of the slope and the unstable nature of the shale.

11. Okaton-Mariaville Association

Shallow, well drained, moderately steep to very steep, clayey and loamy soils on uplands

This association is on several buttes that rise above the surrounding shale plain. Strongly cemented sandstone commonly crops out on the upper sides of the buttes. Boulder-sized fragments of the sandstone commonly are on the surface. Slopes generally are steep and very steep, and the exposed sandstone is almost vertical rimrock.

This association makes up about 1 percent of the county. It is about 45 percent Okaton soils, 25 percent Mariaville soils, and 30 percent minor soils.

The clayey Okaton soils are on side slopes. In this association they have a slope of 15 to 50 percent. Typically, the surface layer is light olive brown bouldery silty clay. The next layer is pale yellow and light olive brown silty clay. The underlying material is light yellowish brown very shaly clay. Pale yellow and light olive brown shale is at a depth of about 15 inches. The soils are calcareous throughout.

The loamy Mariaville soils are on the upper side slopes and in rimrock areas. In this association they have a slope of 15 to 40 percent. Typically, the surface layer is grayish brown loam. The next layer is light brownish gray loam. The underlying material is light gray loam. White, soft siltstone is at a depth of about 18 inches. The soils are calcareous throughout.

Minor in this association are the deep, loamy Anselmo soils below the rimrock areas; the moderately deep Lakoma soils on the less sloping side slopes; the deep, clayey Promise soils on foot slopes; and the deep, silty Reliance soils on the tops of the buttes.

Nearly all of this association is range. Controlling erosion and runoff is the main concern of management. The major soils are suited to range and to rangeland wildlife habitat. They generally are unsuited to cultivated crops and to tame pasture and hay because of the slope and the numerous boulders.

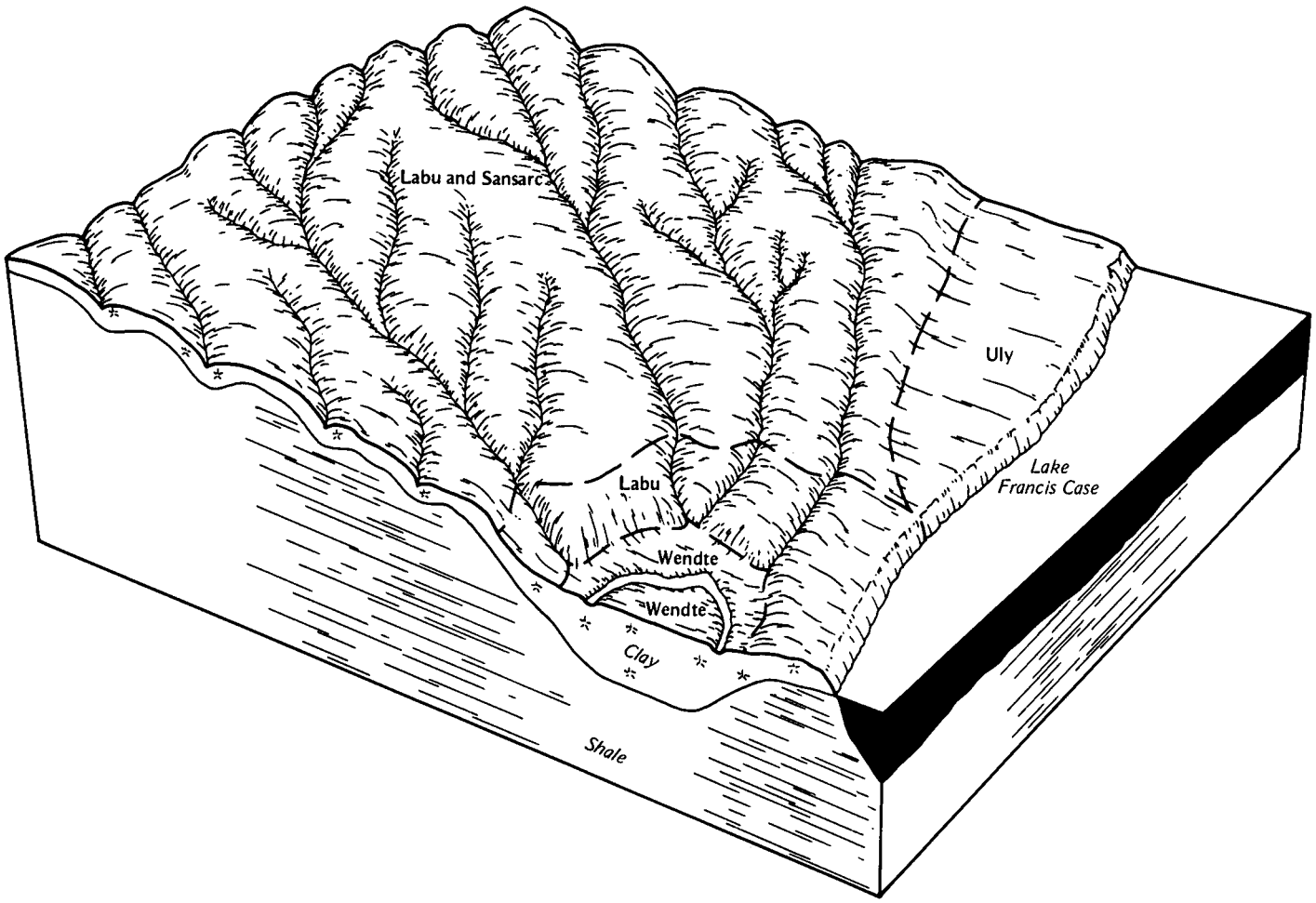


Figure 4.—Pattern of soils and parent material in the Labu-Sansarc association.

Nearly Level, Clayey and Loamy Soils on Flood Plains

These soils make up about 1 percent of the county. About 60 percent of the acreage is range. Conserving moisture during dry periods is the main management concern.

12. Wendte-Haynie Variant Association

Deep, moderately well drained and well drained, nearly level, clayey and loamy soils on the flood plains along the Missouri River

This association is in areas on the flood plains along the Missouri River where the soils are protected from flooding by Fort Randall Dam.

This association makes up less than 1 percent of the county. It is about 50 percent Wendte soils, 30 percent Haynie Variant soils, and 20 percent minor soils.

The moderately well drained Wendte soils are on broad flats and in slight depressions. Slopes range from 0 to 2 percent. Typically, the surface layer is grayish brown, calcareous silty clay. The underlying material is grayish brown, pale brown, and light brownish gray, stratified, calcareous silty clay and silty clay loam.

The well drained Haynie Variant soils are on low rises and ridges. Slopes range from 0 to 2 percent. Typically, the surface layer is grayish brown very fine sandy loam. The underlying material is light brownish gray and light gray very fine sandy loam over light brownish gray loamy very fine sand.

Minor in this association are the sandy Inavale soils adjacent to the river and Riverwash on sandbars and islands in the river.

About 60 percent of this association supports native grasses and is used for grazing and hay. Some areas that support an overstory of deciduous trees are used for wildlife habitat. The trees provide protection for livestock. Corn, small grain, and alfalfa are the main cultivated crops. Controlling wind erosion and improving fertility are the main management concerns in cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, range, and openland and rangeland wildlife habitat.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Reliance silty clay loam, 0 to 3 percent slopes, is one of several phases in the Reliance series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Anselmo-Holt fine sandy loams, 6 to 9 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The names of some map units identified on the detailed soil maps do not fully agree with those identified on the maps in the published surveys of Tripp County, South Dakota, and Boyd and Keya Paha Counties, Nebraska. Differences are the result of variations in the design and composition of map units or changes and refinements in series concepts.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials of the soils for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

AaA—Agar silt loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is brown and pale brown, friable silty clay loam about 23 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. It has accumulations of carbonate in the upper part. In some areas the subsoil contains less clay.

Included with this soil in mapping are small areas of Coly and Onita soils. These soils make up less than 10 percent of any one mapped area. Coly soils have free carbonates at the surface and contain less clay in the subsoil than the Agar soil. Also, they are on steeper parts of the landscape. The moderately well drained Onita soils are in swales.

Fertility is medium and the content of organic matter moderate in the Agar soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Measures that conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface is an example.

This soil is suited to native grasses, but very few areas are used for range. The native vegetation dominantly is western wheatgrass, green needlegrass, and big bluestem. Overused areas are dominated by western wheatgrass, needleandthread, and blue grama. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIc-2; Silty range site.

AaB—Agar silt loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are long and slightly convex.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is brown and pale brown, friable silty clay loam about 23 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. It has accumulations of carbonate in the upper part. In some areas the subsoil contains less clay.

Included with this soil in mapping are small areas of Coly and Onita soils. These soils make up less than 10 percent of any one mapped area. Coly soils have free carbonates at the surface and contain less clay in the subsoil than the Agar soil. Also, they are on steeper parts of the landscape. The moderately well drained Onita soils are in swales.

Fertility is medium and the content of organic matter moderate in the Agar soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface is an example. Contour farming, grassed waterways, and terraces also help to control erosion.

This soil is suited to native grasses, but very few areas are used for range. The native vegetation dominantly is western wheatgrass, green needlegrass, and big bluestem. Overused areas are dominated by western wheatgrass, needleandthread, and blue grama. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIe-1; Silty range site.

AdC—Anselmo-Dunday complex, 3 to 9 percent slopes. These deep, gently sloping and moderately sloping soils are on uplands. The well drained Anselmo soil is on the lower slopes. The somewhat excessively drained Dunday soil is on the upper slopes. Areas are irregular in shape. They are 50 to 70 percent Anselmo soil and 25 to 45 percent Dunday soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Anselmo soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown and pale brown, very friable fine sandy loam about 15 inches thick. The underlying material is pale brown and light gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 48 inches. In some areas the surface layer is not so dark. In other areas the sandstone is at a depth of 20 to 40 inches. In places the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Dunday soil is dark grayish brown loamy fine sand about 10 inches thick. The next 7 inches is dark brown, very friable loamy fine sand. The underlying material to a depth of 60 inches is yellowish brown and very pale brown fine sand.

Included with these soils in mapping are small areas of Valentine soils. These included soils make up less than 10 percent of any one mapped area. They are on the higher convex parts of the landscape. Their surface layer generally is not so dark as that of the Anselmo and Dunday soils.

Fertility is medium and the content of organic matter moderate in the Anselmo soil. Fertility and the content of organic matter are low in the Dunday soil. Tilth is good in both soils. Available water capacity is moderate in the Anselmo soil and low in the Dunday soil. Permeability is moderately rapid in the Anselmo soil and rapid in the Dunday soil. Runoff is slow on both soils.

Most of the acreage supports native grasses. These soils are suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are dominated by blue grama, needleandthread, and sedges. If overuse continues, sand dropseed and weeds dominate the site. Also, sand blowouts are more likely to form along livestock trails and around watering facilities.

The Anselmo soil is suited to cultivated crops, but the Dunday soil generally is unsuited because it is highly susceptible to wind erosion. Measures that control wind erosion, conserve moisture, and improve fertility are the

main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Stripcropping also helps to control wind erosion.

These soils are suited to tame pasture and hay. Productivity is limited, however, because the Dunday soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

These soils are suited to windbreaks and environmental plantings, but the Dunday soil is droughty and the hazard of wind erosion severe. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well on the Anselmo soil. Only evergreens can be successfully established on the Dunday soil. Preparing the soil for planting in the spring helps to control wind erosion.

The Anselmo soil is in capability unit IVe-8, Sandy range site; the Dunday soil is in capability unit VIe-7, Sands range site.

AhB—Anselmo-Holt fine sandy loams, 2 to 6 percent slopes. These well drained, gently sloping soils are on uplands. The deep Anselmo soil is on side slopes. The moderately deep Holt soil is on the upper slopes and ridges. Areas are irregular in shape. They are 50 to 60 percent Anselmo soil and 25 to 35 percent Holt soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Anselmo soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown and pale brown, very friable fine sandy loam about 15 inches thick. The underlying material is pale brown and light gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 48 inches. In places the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Holt soil is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable fine sandy loam about 18 inches thick. The underlying material is light brownish gray, calcareous fine sandy loam. White, weakly consolidated sandstone is at a depth of about 30 inches. In places the subsoil contains less clay.

Included with these soils in mapping are small areas of the somewhat excessively drained Dunday soils. These included soils make up less than 15 percent of any one mapped area. They contain more sand and less clay throughout than the Anselmo soil. They are in positions on the landscape similar to those of the Anselmo soil.

Fertility is medium and the content of organic matter moderate in the Anselmo and Holt soils. Tilth is good. Available water capacity is moderate in the Anselmo soil and low in the Holt soil. Permeability is moderately rapid in the Anselmo soil and moderate in the Holt soil. Runoff is slow on both soils.

About half of the acreage is cropland. These soils are suited to cultivated crops, but wind erosion is a hazard. Also, the Holt soil is droughty. Measures that control wind erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, stripcropping, and field windbreaks also help to control erosion.

Seeding these soils to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the Holt soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

These soils are suited to range. The native vegetation dominantly is prairie sandreed, little bluestem, and needleandthread. Overused areas are dominated by needleandthread, blue grama, and sedges.

These soils are suited to windbreaks and environmental plantings, but the Holt soil is droughty. All climatically suited trees and shrubs grow well on the Anselmo soil, but optimum growth is unlikely on the Holt soil. Preparing the soil for planting in the spring helps to control wind erosion.

The capability unit is IIIe-8; Sandy range site.

AhC—Anselmo-Holt fine sandy loams, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The deep Anselmo soil is on side slopes. The moderately deep Holt soil is on the upper slopes and ridges. Areas are irregular in shape. They are 45 to 55 percent Anselmo soil and 35 to 45 percent Holt soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Anselmo soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown, very friable fine sandy loam about 15 inches thick. The underlying material is pale brown and light gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 48 inches. In places the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Holt soil is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable fine sandy loam about 18 inches thick. The underlying material is light brownish gray, calcareous fine sandy loam. White, weakly consolidated sandstone is at a depth of about 30 inches. In places the subsoil contains less clay.

Included with these soils in mapping are small areas of Dunday and Tassel soils. These included soils make up

less than 10 percent of any one mapped area. Dunday soils contain more sand and less clay throughout than the Anselmo soil. They are in positions on the landscape similar to those of the Anselmo soil. Tassel soils are 6 to 20 inches deep over sandstone. They are higher on the landscape than the Holt soil.

Fertility is medium and the content of organic matter moderate in the Anselmo and Holt soils. Tilth is good. Available water capacity is moderate in the Anselmo soil and low in the Holt soil. Permeability is moderately rapid in the Anselmo soil and moderate in the Holt soil. Runoff is medium on both soils.

About half of the acreage is cropland. These soils are suited to cultivated crops, but erosion is a hazard. Also, the Holt soil is droughty. Measures that control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, stripcropping, and field windbreaks also help to control erosion.

Seeding these soils to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the Holt soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

These soils are suited to range. The native vegetation dominantly is prairie sandreed, little bluestem, and needleandthread. Overused areas are dominated by needleandthread, Kentucky bluegrass, and sedges. If overuse continues, sand blowouts are more likely to form along livestock trails and around watering facilities.

These soils are suited to windbreaks and environmental plantings, but the Holt soil is droughty. All climatically suited trees and shrubs grow well on the Anselmo soil, but optimum growth is unlikely on the Holt soil. Preparing the soil for planting in the spring helps to control wind erosion. Planting on the contour helps to control water erosion.

The capability unit is IVe-8; Sandy range site.

AtE—Anselmo-Tassel fine sandy loams, 6 to 25 percent slopes. These well drained, moderately sloping to moderately steep soils are on uplands. The deep Anselmo soil is on the less sloping side slopes. The shallow Tassel soil is on knolls and ridges. Areas are irregular in shape. They are 55 to 65 percent Anselmo soil and 25 to 35 percent Tassel soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Anselmo soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown and pale brown, very friable fine sandy loam about 15 inches thick. The underlying material is pale brown and light gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 48 inches. In some areas the sandstone is at a depth of 20 to 40 inches. In places the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Tassel soil is grayish brown fine sandy loam about 7 inches thick. The underlying material is light gray fine sandy loam. Pale yellow, weakly consolidated sandstone is at a depth of about 14 inches. The soil is calcareous throughout. In places it contains more silt and less sand.

Included with these soils in mapping are small areas of Dunday soils. These included soils make up less than 10 percent of any one mapped area. They contain more sand and less clay throughout than the Anselmo soil. They are in positions on the landscape similar to those of the Anselmo soil.

Fertility is medium and the content of organic matter moderate in the Anselmo soil. Fertility and the content of organic matter are low in the Tassel soil. Available water capacity is moderate in the Anselmo soil and very low in the Tassel soil. Permeability is moderately rapid in both soils. Runoff is medium on the Anselmo soil and rapid on the Tassel soil.

Most of the acreage supports native grasses. These soils are suited to range. The native vegetation on the Anselmo soil dominantly is bluestems and prairie sandreed. That on the Tassel soil dominantly is little bluestem, sideoats grama, and blue grama. If the range is overused, the site is dominated by needleandthread, blue grama, and sedges. Also, sand blowouts are more likely to form along livestock trails and around watering facilities.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because they are too steep and because the Tassel soil is shallow. The less sloping areas of the Anselmo soil, however, can be seeded to tame pasture plants or used for environmental plantings.

The Anselmo soil is in capability unit VIe-6, Sandy range site; the Tassel soil is in capability unit VIe-10, Shallow range site.

BaE—Betts loam, 15 to 40 percent slopes. This deep, well drained, moderately steep and steep soil is on the upper parts of the breaks along the Missouri River. In places stones and boulders are on the surface. Areas are long and narrow.

Typically, the surface layer is grayish brown, calcareous loam about 5 inches thick. The next 13 inches is grayish brown, calcareous, very friable clay loam. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam and loam. It has accumulations of carbonate throughout and has stones as much as 10 inches in diameter in the upper part.

Included with this soil in mapping are small areas of Coly and Okaton soils. These soils make up less than 15 percent of any one mapped area. The silty Coly soils are

in positions on the landscape similar to those of the Betts soil. The shallow Okaton soils are higher on the landscape than the Betts soil.

Fertility and the content of organic matter are low in the Betts soil. Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow in the underlying material. Runoff is rapid. The shrink-swell potential is moderate.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is little bluestem, sideoats grama, and needleandthread. Overused areas are dominated by needleandthread and blue grama.

This soil generally is too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-3; Thin Upland range site.

Bb—Bon silt loam. This deep, well drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface soil is very dark gray silt loam about 27 inches thick. The underlying material to a depth of 60 inches is grayish brown and dark gray, calcareous loam and silt loam stratified with thin layers of silty clay loam and loamy fine sand. In some areas free carbonates are within a depth of 15 inches.

Included with this soil in mapping are small areas of Mosher and Onita soils. These soils make up less than 15 percent of any one mapped area. Mosher soils have a sodium affected subsoil. They are on the low parts of the landscape. Onita soils are not stratified and contain more clay throughout than the Bon soil. They are adjacent to the uplands.

Fertility and the content of organic matter are high in the Bon soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

About half of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is big bluestem, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass, Kentucky bluegrass, and sedges.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. The main management needs in cultivated areas are measures that conserve moisture during dry periods. Leaving crop residue on the surface is an example. Floodwater delays planting in some years, but in most years the additional moisture is beneficial and the flood damage is minor.

This soil is suited to windbreaks and environmental plantings. The trees and shrubs that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3; Overflow range site.

Bc—Bon silt loam, channeled. This deep, moderately well drained, nearly level soil is on flood plains that are dissected by narrow channels and partly filled old stream meanders. It is frequently flooded. Areas are long and narrow.

Typically, the surface soil is very dark gray silt loam about 27 inches thick. The underlying material to a depth of 60 inches is grayish brown and dark gray, calcareous loam and silt loam stratified with thin layers of silty clay loam and loamy fine sand. In some areas free carbonates are within a depth of 15 inches.

Included with this soil in mapping are small areas of Cass, Mosher, Onita, and Wendte soils. These soils make up less than 25 percent of any one mapped area. Cass soils contain more sand throughout than the Bon soil. Onita, Mosher, and Wendte soils contain more clay throughout than the Bon soil. Also, the Mosher soils have a sodium affected subsoil. All of the included soils are in positions on the landscape similar to those of the Bon soil.

Fertility and the content of organic matter are high in the Bon soil. Available water capacity also is high. Permeability is moderate. A seasonal high water table is at a depth of 4 to 6 feet in the spring of most years. Runoff is slow.

Most areas support native grasses. This soil is suited to range. The native vegetation dominantly is big bluestem, indiangrass, switchgrass, and deciduous trees. The trees provide protection for wildlife and livestock. Overused areas are dominated by western wheatgrass and Kentucky bluegrass.

This soil generally is unsuited to cultivated crops because it is dissected into small tracts and is subject to flooding in the spring. It is suited to tame pasture and hay, but harvesting hay is difficult because of the channeled landscape. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. They can be planted by hand. Because of the meandering channels, however, they generally cannot be planted by machine.

The capability unit is VIw-1; Overflow range site.

BID—Boro-Lakoma silty clays, 9 to 15 percent slopes. These well drained, strongly sloping soils are on uplands. The deep Boro soil is on side slopes. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. The moderately deep Lakoma soil is on the upper side slopes and ridges. Areas are irregular in shape. They are 45 to 55 percent Boro soil and 30 to 40 percent Lakoma soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Boro soil is grayish brown silty clay about 5 inches thick. The subsoil is light brownish gray, firm silty clay about 26 inches thick. The underlying material to a depth of 60 inches is light brownish gray and pale yellow silty clay. The soil is calcareous throughout. In places the dark surface layer is more than 7 inches thick.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. The soil is calcareous throughout. In some areas the shale is at a depth of 8 to 20 inches.

Included with these soils in mapping are small areas of Reliance soils. These included soils make up less than 15 percent of any one mapped area. They contain less clay throughout than the Boro and Lakoma soils. They are in positions on the landscape similar to those of the Boro soil.

Fertility and the content of organic matter are low in the Boro and Lakoma soils. Available water capacity is moderate in the Boro soil and low in the Lakoma soil. Permeability is slow in both soils. Runoff is rapid. The shrink-swell potential is high.

Most of the acreage supports native grasses. These soils are suited to range. The native vegetation on the Boro soil dominantly is western wheatgrass and green needlegrass. That on the Lakoma soil dominantly is sideoats grama, little bluestem, and western wheatgrass. Overused areas are dominated by blue grama and sedges.

These soils generally are too steep for cultivated crops. They are suited, however, to tame pasture and hay and windbreaks and environmental plantings. Examples of suitable pasture plants are alfalfa, western wheatgrass, intermediate wheatgrass, and smooth bromegrass. Windbreaks and environmental plantings can be established, but optimum growth is unlikely because the clayey subsoil can restrict the penetration of plant roots. Planting on the contour helps to control erosion.

The capability unit is VIe-4; Clayey range site.

BmB—Boro-Millboro silty clays, 2 to 6 percent slopes. These deep, well drained, gently sloping soils are on uplands. The Boro soil is on ridges. The Millboro soil is on side slopes. When dry, these soils are characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. They are 55 to 65 percent Boro soil and 30 to 40 percent Millboro soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Boro soil is grayish brown silty clay about 5 inches thick. The subsoil is light brownish gray, firm silty clay about 26 inches thick. The underlying material to a depth of 60 inches is light brownish gray and pale yellow silty clay. The soil is calcareous throughout. In places shale is at a depth of 20 to 40 inches.

Typically, the surface soil of the Millboro soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In places the soil contains less clay throughout.

Included with these soils in mapping are small areas of Witten soils. These included soils make up about 5 percent of any one mapped area. They are in swales. They are dark to a depth of more than 20 inches.

Fertility is low in the Boro soil and medium in the Millboro soil. The content of organic matter is low in the Boro soil and moderate in the Millboro soil. Tilth is poor in both soils. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high in the Boro soil and very high in the Millboro soil.

Most of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion, conserve moisture, and improve tilth in areas of both soils and that improve the fertility of the Boro soil are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Deferring tillage when the soils are wet and chiseling or subsoiling improve tilth and increase the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

These soils are suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, western wheatgrass, smooth bromegrass, and intermediate wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

These soils are suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

These soils are suited to windbreaks and environmental plantings. They take in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4; Clayey range site.

BmC—Boro-Millboro silty clays, 6 to 9 percent slopes. These deep, well drained, moderately sloping soils are on uplands. The Boro soil is on ridges. The

Millboro soil is on side slopes. When dry, these soils are characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. They are 55 to 65 percent Boro soil and 30 to 40 percent Millboro soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Boro soil is grayish brown silty clay about 5 inches thick. The subsoil is light brownish gray, firm silty clay about 26 inches thick. The underlying material to a depth of 60 inches is light brownish gray and pale yellow silty clay. The soil is calcareous throughout. In places shale is at a depth of 20 to 40 inches.

Typically, the surface soil of the Millboro soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In places the soil contains less clay throughout.

Included with these soils in mapping are small areas of Witten soils. These included soils make up about 5 percent of any one mapped area. They are in swales. They are dark to a depth of more than 20 inches.

Fertility is low in the Boro soil and medium in the Millboro soil. The content of organic matter is low in the Boro soil and moderate in the Millboro soil. Tilth is poor in both soils. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high in the Boro soil and very high in the Millboro soil.

Most of the acreage is cropland. These soils are suited to cultivated crops. If tilled when wet, however, they become compacted. Also, they are very erosive because of a slow rate of water intake and the slope. Measures that control erosion, conserve moisture, and improve tilth in areas of both soils and that improve the fertility of the Boro soil are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Deferring tillage when the soils are wet and chiseling or subsoiling improve tilth and increase the rate of water intake. Contour farming, terraces, and grassed waterways help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

These soils are suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, western wheatgrass, intermediate wheatgrass, and smooth bromegrass. Deferred grazing during wet periods helps to prevent surface compaction.

These soils are suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

These soils are suited to windbreaks and environmental plantings. They take in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4; Clayey range site.

CaA—Carter-Hurley complex, 0 to 3 percent slopes. These deep, moderately well drained, nearly level soils are on uplands. The Carter soil is on slight rises. The Hurley soil is in small, shallow depressions. Areas are irregular in shape. They are 50 to 60 percent Carter soil and 30 to 40 percent Hurley soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Carter soil is dark gray silty clay loam about 6 inches thick. The subsoil is about 17 inches thick. It is dark grayish brown, extremely firm clay in the upper part and grayish brown, very firm, calcareous silty clay in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay. It has accumulations of carbonate throughout.

Typically, the surface layer of the Hurley soil is gray silt loam about 4 inches thick. The subsoil is dark gray, extremely firm clay about 15 inches thick. In the lower part it is calcareous and has a few accumulations of salts. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay and silty clay. It has accumulations of carbonate and salts throughout.

Included with these soils in mapping are small areas of Millboro, Promise, and Witten soils. These included soils make up less than 10 percent of any one mapped area. They do not have a sodium affected subsoil. The well drained Millboro and Promise soils are slightly higher on the landscape than the Carter and Hurley soils. Witten soils contain less clay in the subsoil than the Carter and Hurley soils. They are in swales.

Fertility is medium in the Carter soil and low in the Hurley soil. The content of organic matter is moderate in the Carter soil and low in the Hurley soil. Both soils have a dense, sodium affected subsoil that severely restricts the penetration of plant roots. Available water capacity is moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

About half of the acreage supports native grasses. These soils are suited to range, but the dense, compact subsoil limits productivity and the variety of suitable grasses. The native vegetation on the Carter soil dominantly is western wheatgrass, green needlegrass, and blue grama. That on the Hurley soil dominantly is western wheatgrass, blue grama, and buffalograss. Overused areas are dominated by buffalograss and sedges. After continued overuse, many areas are bare. Restricted use during wet periods helps to prevent surface compaction.

The Carter soil is suited to cultivated crops, but growth is severely restricted because of the dense subsoil. No crops grow well on the Hurley soil. Early maturing small grain is better suited than row crops. Measures that improve tilth are the main management needs. Examples are applying manure, including grasses and legumes in the cropping system, and subsoiling.

This map unit is suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and pubescent wheatgrass can be grown on the Carter soil, but very little production can be expected on the Hurley soil. Deferred grazing during wet periods helps to prevent surface compaction.

The Carter soil is suited to windbreaks and environmental plantings, but the Hurley soil generally is unsuited. No trees or shrubs grow well on the Hurley soil. Windbreaks can be established, but optimum growth is unlikely.

The Carter soil is in capability unit IVs-2, Claypan range site; the Hurley soil is in capability unit VIs-1, Thin Claypan range site.

CbA—Carter-Promise complex, 0 to 3 percent slopes. These deep, nearly level soils are on uplands. The moderately well drained Carter soil is on flats or in slightly concave areas. The well drained Promise soil is on slight rises. Areas are irregular in shape. They are 55 to 65 percent Carter soil and 30 to 40 percent Promise soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Carter soil is dark gray silty clay loam about 6 inches thick. The subsoil is about 17 inches thick. It is dark grayish brown, extremely firm clay in the upper part and grayish brown, very firm, calcareous silty clay in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay. It has accumulations of carbonate throughout.

Typically, the surface layer of the Promise soil is dark grayish brown clay about 10 inches thick. It is calcareous in the lower part. The subsoil is dark grayish brown and grayish brown, very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay. In places the soil is moderately well drained. In some areas it contains less clay throughout.

Included with these soils in mapping are small areas of Hurley soils. These included soils make up less than 5 percent of any one mapped area. They have visible salts within a depth of 16 inches. They are in small depressions.

Fertility is medium and the content of organic matter moderate in the Carter and Promise soils. Tilth is poor. The Carter soil has a dense, sodium affected subsoil that severely restricts the penetration of plant roots. Available water capacity is moderate in both soils. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage is cropland. These soils are suited to cultivated crops. They are better suited to early maturing crops, such as small grain, than to row crops. Measures that conserve moisture, improve tilth, and control wind erosion are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake. Stripcropping and field windbreaks help to control wind erosion.

These soils are suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and pubescent wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

These soils are suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama, buffalograss, and sedges.

These soils are suited to windbreaks and environmental plantings. They take in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The Carter soil is in capability unit IVs-2, Claypan range site; the Promise soil is in capability unit IIIs-3, Clayey range site.

Cd—Cass fine sandy loam, channeled. This deep, well drained, nearly level soil is on flood plains that are dissected by narrow channels. It is occasionally flooded. Areas are long and narrow.

Typically, the surface layer is dark grayish brown fine sandy loam about 19 inches thick. The next 15 inches is grayish brown, very friable fine sandy loam. The underlying material to a depth of 60 inches is pale brown and light brownish gray, calcareous fine sandy loam. It has accumulations of carbonate in the lower part. In some areas slopes are as much as 6 percent.

Included with this soil in mapping are small areas of Anselmo, Bon, and Fedora soils. These soils make up less than 10 percent of any one mapped area. Anselmo soils are not stratified. They are on the slightly higher parts of the landscape near the edges of the mapped areas. Bon and Fedora soils are in positions on the landscape similar to those of the Cass soil. Bon soils contain more clay and less sand throughout than the Cass soil. The poorly drained, calcareous Fedora soils have a water table at a depth of 1 to 4 feet. Also included is a soil that has a water table at a depth of 4 to 6 feet. This included soil is in the lower areas.

Fertility is medium and the content of organic matter moderate in the Cass soil. Available water capacity is moderate. Permeability is moderately rapid. Runoff is slow.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is bluestems and switchgrass. Overused areas are dominated by blue grama and sedges.

This soil generally is unsuited to cultivated crops because it is dissected into small tracts and is subject to flooding in the spring. It is suited to tame pasture and hay, but harvesting hay is difficult because of the channeled landscape. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. They can be planted by hand. Because of the meandering stream channels, however, they generally cannot be planted by machine.

The capability unit is VIw-1; Overflow range site.

CrC—Coly silt loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are long and narrow. Slopes are short and convex.

Typically, the surface layer is grayish brown, calcareous silt loam about 5 inches thick. The next 8 inches is brown, friable, calcareous silt loam. It has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. It has accumulations of carbonate in the upper part.

Included with this soil in mapping are small areas of Sansarc and Uly soils. These soils make up less than 15 percent of any one mapped area. Sansarc soils are 4 to 20 inches deep over shale. They are on steep breaks below areas of the Coly soil. Uly soils are deeper to free carbonates than the Coly soil. They are on the less sloping parts of the landscape.

Fertility and the content of organic matter are low in the Coly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is cropland. This soil is suited to cultivated crops. Erosion is a hazard, however, and the high content of lime in the surface layer adversely affects the availability of plant nutrients. Measures that control erosion and improve fertility are the main management needs. Including grasses and legumes in the cropping system and leaving crop residue on the surface are examples. Contour farming, grassed waterways, and terraces also help to control erosion.

This soil is suited to range. The native vegetation dominantly is little bluestem, green needlegrass, and needleandthread. Overused areas are dominated by needleandthread, sideoats grama, and blue grama.

This soil is suited to tame pasture and hay, but the high content of lime in the surface layer adversely affects the availability of plant nutrients. Alfalfa, intermediate wheatgrass, pubescent wheatgrass, and smooth bromegrass are the best suited pasture plants.

This soil is suited to windbreaks and environmental plantings, but the high content of lime in the surface layer is a limitation. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-3; Thin Upland range site.

CrE—Coly silt loam, 9 to 25 percent slopes. This deep, well drained, strongly sloping and moderately steep soil is on uplands. Areas are long and narrow. Slopes are short and convex.

Typically, the surface layer is grayish brown, calcareous silt loam about 5 inches thick. The next 8 inches is brown, friable, calcareous silt loam. It has accumulations of carbonate. The underlying material to a depth of 60 inches is brown and pale brown, calcareous silt loam. It has accumulations of carbonate in the upper part.

Included with this soil in mapping are small areas of Sansarc and Uly soils. These soils make up less than 20 percent of any one mapped area. Sansarc soils are 4 to 20 inches deep over shale. They are on steep breaks below areas of the Coly soil. Uly soils are deeper to free carbonates than the Coly soil. They are on the less sloping parts of the landscape.

Fertility and the content of organic matter are low in the Coly soil. Available water capacity is high. Permeability is moderate. Runoff is rapid.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is little bluestem, green needlegrass, and needleandthread. Overused areas are dominated by needleandthread, sideoats grama, and blue grama.

This soil generally is too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIe-3; Thin Upland range site.

DaA—Dunday loamy fine sand, 0 to 3 percent slopes. This deep, somewhat excessively drained, nearly level soil is on uplands. Areas are irregular in shape.

Typically, the surface layer is dark grayish brown loamy fine sand about 10 inches thick. The next 7 inches is dark brown, very friable loamy fine sand. The underlying material to a depth of 60 inches is yellowish brown and very pale brown fine sand. In places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Anselmo, Vetal, and Whitelake soils. These soils make up less than 10 percent of any one mapped area. Anselmo and Vetal soils contain more clay and less sand between depths of 10 and 40 inches than the Dunday soil. Whitelake soils have a sodium affected subsoil. Anselmo soils are in positions on the landscape similar to those of the Dunday soil. Vetal and Whitelake soils are on the lower parts of the landscape.

Fertility and the content of organic matter are low in the Dunday soil. Tilth is good. Available water capacity is low. Permeability is rapid. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but the hazard of wind erosion is severe. Measures that control wind erosion, conserve moisture, and improve fertility are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Stripcropping also helps to control wind erosion.

This soil is suited to tame pasture and hay. Productivity is limited, however, because the soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil is suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are dominated by sand dropseed, blue grama, and sedges. If overuse continues, sand blowouts are more likely to form along livestock trails and around watering facilities.

This soil is suited to windbreaks and environmental plantings, but it is droughty and the hazard of wind erosion is severe. Only evergreens can be successfully established. Planting the trees and shrubs directly in sod helps to control wind erosion.

The capability unit is IVe-9; Sands range site.

Du—Durrstein silt loam. This deep, poorly drained, nearly level soil is on flood plains along drainageways. It is occasionally flooded for brief periods. Areas are long and narrow or irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is gray silt loam about 1 inch thick. The subsoil is about 17 inches thick. It is dark gray, firm clay and clay loam in the upper part and grayish brown, firm, calcareous clay loam in the lower part. The underlying material to a depth of 60 inches is light gray and gray, calcareous clay loam and silt loam. It has many fine accumulations of carbonate and salts in the upper part.

Included with this soil in mapping are small areas of Bon and Mosher soils. These soils make up less than 10 percent of any one mapped area. They are higher on the landscape than the Durrstein soil. Bon soils do not have a sodium affected subsoil. Mosher soils are moderately well drained.

Fertility and the content of organic matter are low in the Durrstein soil. The sodium in this soil adversely affects the growth of most plants. Tilth is poor. Available water capacity is moderate. Permeability is slow. A seasonal high water table is within a depth of 1 foot during wet periods. Runoff is slow. The shrink-swell potential is high.

Most areas support native grasses. This soil is best suited to range. The native vegetation dominantly is western wheatgrass, cordgrass, and inland saltgrass. Overused areas are dominated by inland saltgrass and weeds.

This soil is suited to tame pasture and hay, but the choice of pasture plants is limited by the wetness and the high degree of salinity. Examples of suitable pasture plants are tall wheatgrass and western wheatgrass.

This soil generally is too wet and too saline for cultivated crops and windbreaks and environmental plantings. The dense claypan subsoil also is a limitation.

The capability unit is VIw-3; Saline Lowland range site.

Fd—Fedora loam. This deep, poorly drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are irregular in shape. Slopes are slightly concave.

Typically, the surface layer is dark gray, calcareous loam about 8 inches thick. The next 24 inches is gray and light brownish gray, very friable, calcareous fine sandy loam. The upper part of the underlying material is gray loam. The lower part to a depth of 60 inches is light brownish gray loamy fine sand. In some areas the soil contains less sand throughout.

Included with this soil in mapping are small areas of Bon, Cass, Platte, and Whitelake soils. These soils make up less than 10 percent of any one mapped area. They do not have free carbonates within a depth of 2 feet. Also, Whitelake soils have a sodium affected subsoil. Bon, Cass, and Platte soils are in positions on the landscape similar to those of the Fedora soil. Whitelake soils are on terraces and are slightly higher on the landscape than the Fedora soil.

Fertility is medium and the content of organic matter moderate in the Fedora soil. Tilth is good. Available water capacity is high. A seasonal high water table is at a depth of 1 to 4 feet most of the year. Permeability is moderately rapid in the upper part of the soil and rapid in the lower part. Runoff is slow.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is big bluestem, indiangrass, and switchgrass. Overused areas are dominated by western wheatgrass, Kentucky bluegrass, and sedges.

This soil is suited to cultivated crops. It is best suited to the crops planted late in the spring, such as corn, because wetness often delays planting. Measures that control wind erosion are needed. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples.

A cover of tame pasture plants or hay is effective in controlling wind erosion. Alfalfa, Garrison creeping foxtail, and smooth bromegrass are suitable.

This soil is suited to windbreaks and environmental plantings. The trees and shrubs that require an abundant moisture supply grow especially well.

The capability unit is IVw-2; Subirrigated range site.

Ha—Haynie Variant-Munjor complex. These deep, well drained, nearly level soils are on the flood plain along the Missouri River. Fort Randall Dam protects the soils from flooding. The Haynie Variant soil is in the low areas. The Munjor soil is in the high areas. These soils occur as one mapped area that is long and narrow in some places and irregularly shaped in others. This area is 50 to 60 percent Haynie Variant soil and 35 to 45 percent Munjor soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Haynie Variant soil is grayish brown very fine sandy loam about 7 inches thick. The underlying material to a depth of 60 inches is stratified light brownish gray and light gray very fine sandy loam and loamy very fine sand. The soil is calcareous throughout.

Typically, the surface layer of the Munjor soil is grayish brown fine sandy loam about 8 inches thick. The upper part of the underlying material is grayish brown and light brownish gray fine sandy loam and loamy very fine sand. The lower part to a depth of about 60 inches is light gray fine sandy loam stratified with thin layers of silt loam and silty clay loam. The soil is calcareous throughout.

Included with these soils in mapping are small areas of Inavale and Wendte soils. These included soils make up less than 10 percent of any one mapped area. Inavale soils contain more sand between depths of 10 and 40 inches than the Haynie Variant and Munjor soils. They are on slight rises. Wendte soils contain more clay throughout than the Haynie Variant and Munjor soils. They are on the lower parts of the flood plain.

Fertility and the content of organic matter are low in the Haynie Variant and Munjor soils. Available water capacity is moderate. Permeability is moderate in the Haynie Variant soil and moderately rapid in the Munjor soil. Runoff is slow on both soils.

About half of the acreage is cropland. These soils are suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that control wind erosion, conserve moisture, and improve fertility are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system.

These soils are suited to range. The native vegetation on the Haynie Variant soil dominantly is western wheatgrass and green needlegrass. That on the Munjor soil dominantly is bluestems and prairie sandreed. Overused areas are dominated by blue grama, needleandthread, and sedges.

These soils are suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

The Haynie Variant soil is in capability unit IIe-1, Silty range site; the Munjor soil is in capability unit IIIe-7, Sandy range site.

HoA—Holt fine sandy loam, 0 to 3 percent slopes. This moderately deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable fine sandy loam about 18 inches thick. The underlying material is light brownish gray, calcareous fine sandy loam. White, weakly consolidated sandstone is at a depth of about 30 inches. In places the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Ree and Vetal soils. These soils make up less than 15 percent of any one mapped area. They are deep. Ree soils contain more clay in the subsoil than the Holt soil. They are in positions on the landscape similar to those of the Holt soil. Vetal soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Holt soil. Tilth is good. Available water capacity is low. Permeability is moderate. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but wind erosion is a hazard. Also, the soil is droughty. Measures that control wind erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Stripcropping and field windbreaks also help to control wind erosion.

Seeding this soil to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil is suited to range. The native vegetation dominantly is bluestems, prairie sandreed, and needleandthread. Overused areas are dominated by needleandthread, blue grama, and sedges.

This soil is suited to windbreaks and environmental plantings, but it is droughty. Optimum growth is unlikely. Preparing the soil for planting in the spring helps to control wind erosion.

The capability unit is IIIe-9; Sandy range site.

HoB—Holt fine sandy loam, 3 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are long and are smooth or convex.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark

grayish brown, grayish brown, and light brownish gray fine sandy loam about 18 inches thick. The underlying material is light brownish gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 30 inches. In places the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Ree, Tassel, and Vetal soils. These soils make up less than 15 percent of any one mapped area. The deep Ree soils contain more clay in the subsoil than the Holt soil. They are in positions on the landscape similar to those of the Holt soil. Tassel soils are 6 to 20 inches deep over sandstone. They are higher on the landscape than the Holt soil. The deep Vetal soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Holt soil. Tilth is good. Available water capacity is low. Permeability is moderate. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but wind erosion is a hazard. Also, the soil is droughty. Measures that control erosion and conserve moisture are the main management needs. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples. Stripcropping and field windbreaks also help to control wind erosion.

Seeding this soil to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil is suited to range. The native vegetation dominantly is little bluestem, prairie sandreed, and needleandthread. Overused areas are dominanted by needleandthread, blue grama, and sedges.

This soil is suited to windbreaks and environmental plantings, but it is droughty. Optimum growth is unlikely. Preparing the soil for planting in the spring helps to control wind erosion. Planting on the contour helps to control water erosion.

The capability unit is IIIe-10; Sandy range site.

HoC—Holt fine sandy loam, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. Areas are irregular in shape. Slopes are convex.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray fine sandy loam about 18 inches thick. The underlying material is light brownish gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 30 inches. In places the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Ree, Tassel, and Vetal soils. These soils make up less than 10 percent of any one mapped area. The deep Ree soils contain more clay in the subsoil than the Holt soil. They are in positions on the landscape similar to those of the Holt soil. Tassel soils are 6 to 20 inches deep over sandstone. They are higher on the landscape than the Holt soil. The deep Vetal soils are dark to a depth of more than 20 inches. They are in swales.

The Holt soil is medium in fertility, and its content of organic matter is moderate. Tilth is good. The available water capacity is low. Permeability is moderate. Runoff is medium.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is little bluestem, prairie sandreed, and needleandthread. Overused areas are dominated by needleandthread, blue grama, and sedges.

This soil is suited to cultivated crops, but wind erosion and water erosion are severe hazards. Also, the soil is droughty. Measures that control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming and grassed waterways help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

Seeding this soil to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil is suited to windbreaks and environmental plantings, but it is droughty. Optimum growth is unlikely. Planting on the contour helps to control water erosion. Preparing the soil for planting in the spring helps to control wind erosion.

The capability unit is IVe-8; Sandy range site.

HoD—Holt fine sandy loam, 9 to 15 percent slopes. This moderately deep, well drained, strongly sloping soil is on uplands. Areas are irregular in shape. Slopes are long and convex.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable fine sandy loam about 18 inches thick. The underlying material is light brownish gray fine sandy loam. White, calcareous sandstone is at a depth of about 30 inches. In places the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Mariaville, Ree, Tassel, and Vetal soils. These soils make up less than 15 percent of any one mapped area. Mariaville and Tassel soils are higher on the landscape

than the Holt soil. Also, Mariaville soils contain less sand throughout and are 10 to 20 inches deep over siltstone. Tassel soils are 6 to 20 inches deep over sandstone. The deep Ree soils contain more clay in the subsoil than the Holt soil. They are in positions on the landscape similar to those of the Holt soil. Vetal soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Holt soil. Available water capacity is low. Permeability is moderate. Runoff is medium.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is little bluestem, prairie sandreed, and needleandthread. Overused areas are dominated by needleandthread, blue grama, and sedges.

Seeding this soil to suitable tame pasture plants is effective in controlling erosion. Productivity is limited, however, because the soil is droughty. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil generally is too steep for cultivated crops. It is suited to windbreaks and environmental plantings, but it is droughty. Optimum growth is unlikely. Planting on the contour helps to control water erosion. Preparing the soil for planting in the spring helps to control wind erosion.

The capability unit is VIe-6; Sandy range site.

Ia—Inavale loamy sand. This deep, somewhat excessively drained, nearly level soil is on flood plains. It is occasionally flooded. Areas are irregular in shape.

Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The next 6 inches is grayish brown loamy sand. The underlying material to a depth of 60 inches is pale brown, stratified fine sand and coarse sand.

Included with this soil in mapping are small areas of Cass, Fedora, and Platte soils. These soils make up less than 10 percent of any one mapped area. The well drained Cass soils are in positions on the landscape similar to those of the Inavale soil. The poorly drained Fedora and Platte soils are on the lower parts of the flood plains.

Fertility and the content of organic matter are low in the Inavale soil. Available water capacity also is low. Permeability is rapid. Runoff is slow.

Nearly all of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is bluestems and prairie sandreed. The ash and willows adjacent to some channels provide protection for livestock and wildlife. Overused areas are dominated by blue grama, sand dropseed, and sedges.

This soil is suited to cultivated crops. Because of a severe hazard of wind erosion, however, it is best suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa and smooth bromegrass. Measures that control wind erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system.

This soil is suited to windbreaks and environmental plantings, but only evergreens can be successfully established. Planting the trees and shrubs directly in sod helps to control wind erosion.

The capability unit is IVe-9; Sands range site.

JaA—Jansen loam, 0 to 3 percent slopes. This well drained, nearly level soil is on uplands. It is moderately deep over coarse sand. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 19 inches thick. It is brown and grayish brown, friable clay loam in the upper part and pale brown, friable sandy clay loam in the lower part. The underlying material to a depth of 60 inches is multicolored coarse sand. In some areas the depth to coarse sand is more than 36 inches. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Brocksburg, O'Neill, and Onita soils. These soils make up less than 15 percent of any one mapped area. Brocksburg and Onita soils are dark to a depth of more than 20 inches. They are slightly lower on the landscape than the Jansen soil. O'Neill soils contain less clay in the subsoil than the Jansen soil. They are on slight rises.

Fertility is medium and the content of organic matter moderate in the Jansen soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderate in the subsoil and very rapid in the underlying coarse sand. Runoff is slow. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain and grasses than to late-maturing crops, such as corn. Measures that conserve moisture are the main management needs. Examples are minimizing tillage and leaving crop residue on the surface.

This soil is suited to tame pasture and hay. It is best suited to drought-resistant grasses, such as crested wheatgrass, pubescent wheatgrass, and smooth bromegrass.

This soil is suited to native grasses, but very few areas are used for range. The native vegetation dominantly is big bluestem and green needlegrass. Overused areas are dominated by blue grama, needleandthread, and sedges.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely.

The capability unit is IIIs-2; Silty range site.

JaB—Jansen loam, 3 to 6 percent slopes. This well drained, gently sloping soil is on uplands. It is moderately deep over coarse sand. Areas are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 19 inches thick. It is brown and grayish brown, friable clay loam in the upper part and pale brown, friable sandy clay loam in the lower part. The underlying material to a depth of 60 inches is multicolored coarse sand. In some areas the depth to coarse sand is more than 36 inches. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Brocksburg, Meadin, and O'Neill soils. These soils make up less than 15 percent of any one mapped area. Brocksburg soils are dark to a depth of more than 20 inches. They are slightly lower on the landscape than the Jansen soil. Meadin and O'Neill soils are on the high parts of the landscape. Meadin soils are 8 to 20 inches deep over gravelly sand. O'Neill soils contain less clay in the subsoil than the Jansen soil.

Fertility is medium and the content of organic matter moderate in the Jansen soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderate in the subsoil and very rapid in the underlying coarse sand. Runoff is medium. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain and grasses than to late-maturing crops, such as corn. Measures that conserve moisture and control erosion are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Contour farming and grassed waterways also help to control erosion.

This soil is suited to tame pasture and hay. It is best suited to drought-resistant grasses, such as crested wheatgrass, pubescent wheatgrass, and smooth bromegrass.

This soil is suited to range. The native vegetation dominantly is big bluestem and green needlegrass. Overused areas are dominated by blue grama, needleandthread, and sedges.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely.

The capability unit is IIIe-6; Silty range site.

JaC—Jansen loam, 6 to 9 percent slopes. This well drained, moderately sloping soil is on uplands. It is moderately deep over coarse sand. Areas are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 19 inches thick. It is brown and grayish brown, friable clay loam in the upper part and pale brown, friable sandy clay loam in the lower part. The underlying material to a depth of 60 inches is multicolored coarse sand. In some areas the depth to coarse sand is more than 36 inches. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Meadin and O'Neill soils. These soils make up less than 10 percent of any one mapped area. They are on the high parts of the landscape. Meadin soils are 8 to 20 inches deep over gravelly sand. O'Neill soils contain less clay in the subsoil than the Jansen soil.

Fertility is medium and the content of organic matter moderate in the Jansen soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderate in the subsoil and very rapid in the underlying gravelly sand. Runoff is medium. The shrink-swell potential is moderate in the subsoil.

About half of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain and grasses than to late-maturing crops, such as corn. Measures that conserve moisture and control erosion are the main management needs. Examples are minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface. Contour farming and grassed waterways also help to control erosion.

This soil is suited to tame pasture and hay. It is best suited to drought-resistant grasses, such as pubescent wheatgrass and smooth bromegrass.

This soil is suited to range. The native vegetation dominantly is little bluestem, big bluestem, and green needlegrass. Overused areas are dominated by blue grama, needleandthread, and sedges.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-5; Silty range site.

JbA—Jansen-Brocksburg loams, 0 to 2 percent slopes. These well drained, nearly level soils are on uplands. They are moderately deep over coarse sand or gravelly sand. The Jansen soil is on slight rises. The Brocksburg soil is in low areas. Areas are irregular in shape. They are 65 to 80 percent Jansen soil and 20 to 30 percent Brocksburg soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Jansen soil is grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 19 inches thick. It is brown and

grayish brown, friable clay loam in the upper part and pale brown, friable sandy clay loam in the lower part. The underlying material to a depth of 60 inches is multicolored sand. In places coarse sand is below a depth of 36 inches.

Typically, the surface soil of the Brocksburg soil is dark grayish brown loam about 15 inches thick. The subsoil is dark grayish brown and brown, friable and firm clay loam about 21 inches thick. The underlying material to a depth of 60 inches is multicolored gravelly sand.

Included with these soils in mapping are small areas of the moderately well drained Onita soils in swales. These included soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Jansen soil. Fertility and the content of organic matter are high in the Brocksburg soil. Tilth is good in both soils. Available water capacity is low or moderate in the Jansen soil and moderate in the Brocksburg soil. Permeability is moderate in the subsoil of both soils and very rapid in the underlying material. Runoff is slow. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. These soils are suited to cultivated crops, but the Jansen soil is somewhat droughty. This soil is better suited to small grain and grasses than to late-maturing crops, such as corn. Measures that conserve moisture are the main management concerns. Minimizing tillage and leaving crop residue on the surface are examples. Farming is delayed in some years when the Brocksburg soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

These soils are suited to tame pasture and hay. Because it is somewhat droughty, the Jansen soil is best suited to drought-resistant grasses, such as crested wheatgrass and pubescent wheatgrass.

These soils are suited to native grasses, but very few areas are used for range. The native vegetation dominantly is big bluestem and green needlegrass. Overused areas are dominated by blue grama, needleandthread, and sedges.

These soils are suited to windbreaks and environmental plantings, but the Jansen soil is somewhat droughty. Trees and shrubs can be established on this soil, but optimum survival, growth, and vigor are unlikely.

The Jansen soil is in capability unit IIIs-2, the Brocksburg soil in capability unit IIs-2; both soils are in Silty range site.

Ko—Kolls clay. This deep, poorly drained soil is in depressions in the uplands. It is ponded during periods of snowmelt or heavy rainfall. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are oval or oblong.

Typically, the surface layer is dark gray clay about 4 inches thick. The subsoil is dark gray, extremely firm, calcareous clay about 30 inches thick. It has accumulations of carbonate in the lower part. The underlying material to a depth of 60 inches is dark gray and gray, very firm, calcareous clay. It has fine accumulations of carbonate in the upper part.

Included with this soil in mapping are small areas of Carter, Hurley, Millboro, and Promise soils. These soils make up less than 10 percent of any one mapped area. The moderately well drained Carter and Hurley soils are higher on the landscape than the Kolls soil. The well drained Millboro and Promise soils are on uplands near the edges of the mapped areas.

Fertility is medium and the content of organic matter moderate in the Kolls soil. Permeability is very slow. Available water capacity is moderate. A seasonal high water table is within a depth of 1.5 feet in the spring. As much as 0.5 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. The native vegetation dominantly is western wheatgrass. Overused areas are dominated by buffalograss, sedges, and weeds. The soil is an excellent site for stock water dugouts.

This soil generally is unsuited to cultivated crops and windbreaks and environmental plantings because of the seasonal wetness. Artificial drainage generally is not feasible because suitable outlets are not available. In a few areas the soil is cropped along with the adjacent soils, but the crops drown in wet years. Western wheatgrass is the best species for planting if cultivated areas are seeded to grass. Garrison creeping foxtail and reed canarygrass also are suited.

The capability unit is Vw-4; Closed Depression range site.

LaB—Labu clay, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are long and slightly convex.

Typically, the surface layer is grayish brown clay about 6 inches thick. The subsoil is grayish brown, firm and very firm clay about 15 inches thick. The underlying material is light brownish gray very shaly clay about 9 inches thick. Light brownish gray, soft shale is at a depth of about 30 inches. The soil is calcareous throughout. Accumulations of carbonate are in the subsoil and underlying material. In some areas the subsoil is more friable. In places the depth to shale is more than 40 inches.

Included with this soil in mapping are small areas of Millboro and Witten soils. These soils make up less than 15 percent of any one mapped area. Millboro soils are

more than 40 inches deep over shale. They are on side slopes. The moderately well drained Witten soils are in swales.

Fertility and the content of organic matter are low in the Labu soil. Tilth is poor. Available water capacity is low. Permeability is slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops. It is subject to surface compaction if tilled when wet, however, and cannot be easily tilled when dry. Measures that control erosion, conserve moisture, and improve tilth and fertility are the main management needs. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, terraces, and grassed waterways help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass, blue grama, and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control water erosion.

The capability unit is IIIe-4; Clayey range site.

LaC—Labu clay, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are long and slightly convex.

Typically, the surface layer is grayish brown clay about 6 inches thick. The subsoil is grayish brown, firm and very firm clay about 15 inches thick. The underlying material is light brownish gray very shaly clay about 9 inches thick. Light brownish gray, soft shale is at a depth of about 30 inches. The soil is calcareous throughout. Accumulations of carbonate are in the subsoil and underlying material. In places the depth to shale is more than 40 inches. In some areas the subsoil is more friable.

Included with this soil in mapping are small areas of Sansarc soils. These soils make up less than 15 percent of any one mapped area. They are 4 to 20 inches deep over shale. They are on the high parts of the landscape.

Fertility and the content of organic matter are low in the Labu soil. Tilth is poor. Available water capacity is low. Permeability is slow. Runoff is medium. The shrink-swell potential is very high.

About half of the acreage is cropland. This soil is suited to cultivated crops. It is subject to surface compaction if tilled when wet, however, and cannot be easily tilled when dry. Measures that control erosion, conserve moisture, and improve tilth and fertility are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Contour farming, terraces, and grassed waterways help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass, blue grama, and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control water erosion.

The capability unit is IVe-4; Clayey range site.

LaD—Labu clay, 9 to 15 percent slopes. This moderately deep, well drained, strongly sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is grayish brown clay about 6 inches thick. The subsoil is grayish brown, firm and very firm clay about 15 inches thick. The underlying material is light brownish gray very shaly clay about 9 inches thick. Light brownish gray, soft shale is at a depth of about 30 inches. The soil is calcareous throughout. Accumulations of carbonate are in the subsoil and underlying material. In places the depth to shale is more than 40 inches. In some areas the subsoil is more friable.

Included with this soil in mapping are small areas of Sansarc soils. These soils make up less than 15 percent of any one mapped area. They are 4 to 20 inches deep over shale. They are on the high parts of the landscape.

Fertility and the content of organic matter are low in the Labu soil. Available water capacity also is low. Permeability is slow. Runoff is rapid. The shrink-swell potential is very high.

Most areas support native grasses. This soil is suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass, blue grama, and sedges.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil generally is too steep for cultivated crops. It is suited to windbreaks and environmental plantings, but optimum growth is unlikely because the clayey subsoil can restrict the penetration of plant roots. Planting on the contour helps to control water erosion.

The capability unit is VIe-4; Clayey range site.

LcF—Labu-Sansarc clays, 15 to 50 percent slopes. These well drained, hilly to very steep soils are on uplands. The moderately deep Labu soil is on the less sloping side slopes. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. The shallow Sansarc soil is on the steeper side slopes and ridges. Landslides are common on the very steep slopes. Areas are irregular in shape. They are 40 to 50 percent Labu soil and 40 to 50 percent Sansarc soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Labu soil is grayish brown clay about 6 inches thick. The subsoil is grayish brown, firm and very firm clay about 15 inches thick. The underlying material is light brownish gray very shaly clay. Light brownish gray, soft shale is at a depth of about 30 inches. The soil is calcareous throughout. Accumulations of carbonate are in the subsoil and underlying material. In places the depth to shale is more than 40 inches. In some areas the soil is not so dense.

Typically, the surface layer of the Sansarc soil is dark grayish brown, calcareous clay about 4 inches thick. The underlying material is grayish brown and light olive gray, calcareous clay and shaly clay. Light olive gray, soft shale is at a depth of about 18 inches. In some areas the soil contains less clay throughout.

Included with these soils in mapping are small areas of Mariaville soils. Also included are steep escarpments where shale crops out. These included soils and rock outcrops make up less than 15 percent of any one mapped area. The loamy Mariaville soils are shallow over siltstone. They are on the higher parts of the landscape.

Fertility and the content of organic matter are low in the Labu and Sansarc soils. Available water capacity is low in the Labu soil and very low in the Sansarc soil. Permeability is slow in both soils. Runoff is rapid. The shrink-swell potential is very high.

Most of the acreage supports native grasses. These soils are suited to range. The native vegetation on the Labu soil dominantly is western wheatgrass, green needlegrass, and big bluestem. That on the Sansarc soil dominantly is little bluestem, green needlegrass, western wheatgrass, and big bluestem. Rocky Mountain juniper and deciduous trees grow in many of the draws and on north-facing slopes. These wooded areas provide protection for livestock and wildlife. Overused areas are dominated by western wheatgrass, sideoats grama, and blue grama. Dams constructed in the deep drainageways impound water for livestock (fig. 5).

These soils are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-8; the Labu soil is in Clayey range site, the Sansarc soil in Shallow Clay range site.

LoD—Lakoma-Okaton silty clays, 9 to 15 percent slopes. These well drained, strongly sloping soils are on uplands. The moderately deep Lakoma soil is on the mid and lower side slopes. The shallow Okaton soil is on ridges. Areas are irregular in shape. They are 60 to 70 percent Lakoma soil and 30 to 40 percent Okaton soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. Gypsum crystals and accumulations of carbonate are in the seams between the shale plates. The soil is calcareous throughout. In places it is not so friable. In some areas the depth to shale is more than 40 inches.

Typically, the surface layer of the Okaton soil is light olive brown silty clay about 4 inches thick. The next 5 inches is pale yellow and light olive brown, friable silty clay. The underlying material is light yellowish brown very shaly clay. Pale yellow and light olive brown, soft shale is at a depth of about 15 inches. Gypsum crystals and accumulations of carbonate are in the seams between the shale plates. The soil is calcareous throughout.

Fertility and the content of organic matter are low in both soils. Available water capacity is low in the Lakoma soil and very low in the Okaton soil. Permeability is slow in both soils. Runoff is rapid. The shrink-swell potential is high.

Most of the acreage supports native grasses. These soils are suited to range. The native vegetation dominantly is bluestems, sideoats grama, and western wheatgrass. Overused areas are dominated by blue grama, sideoats grama, and sedges.

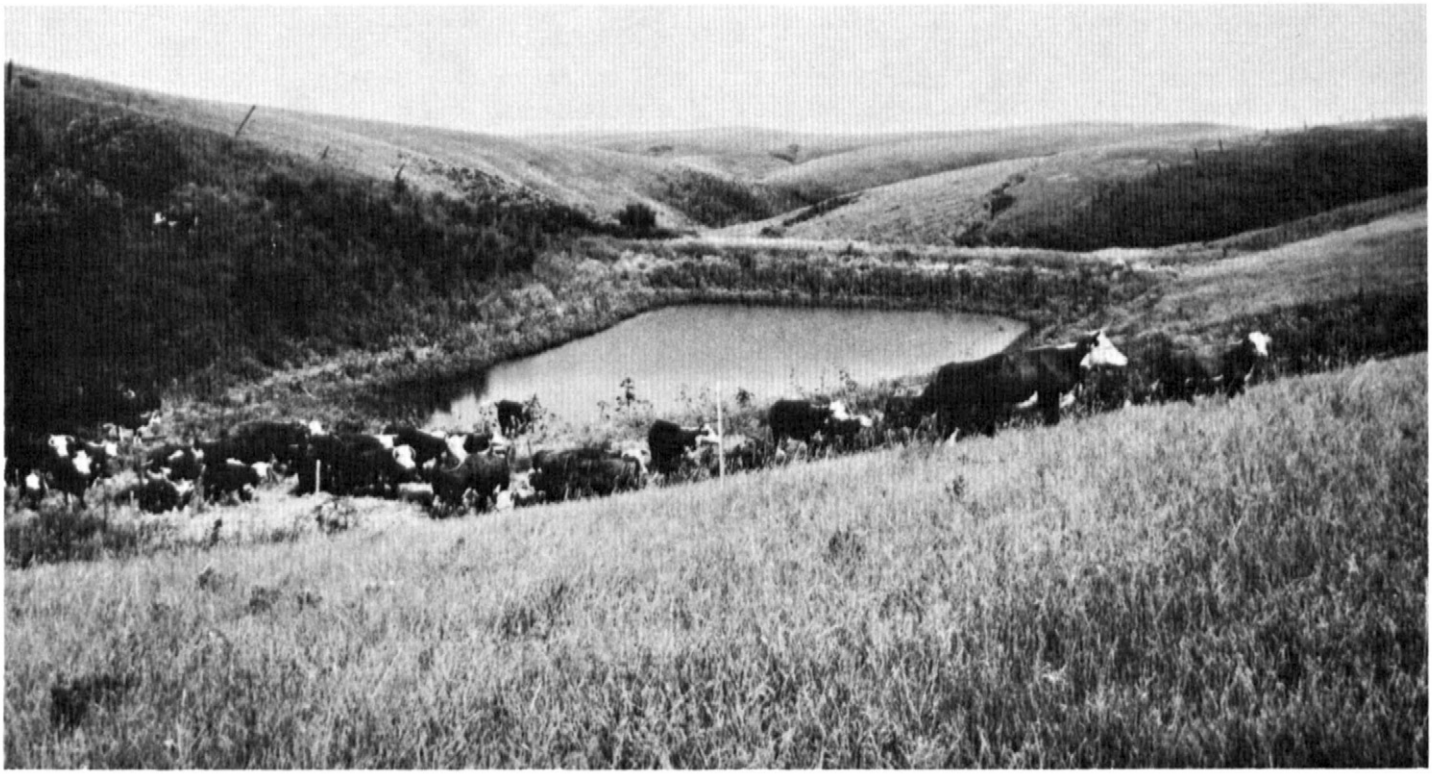


Figure 5.—Impounded stock water in an area of Labu-Sansarc clays, 15 to 50 percent slopes.

These soils generally are too steep and too droughty for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIe-4; the Lakoma soil is in Clayey range site, the Okaton soil in Shallow range site.

LwB—Lakoma-Wewela complex, 2 to 6 percent slopes. These moderately deep, well drained, gently sloping soils are on uplands. The Lakoma soil is on the upper side slopes and ridges. The Wewela soil is on the lower side slopes and in swales. Areas are irregular in shape. They are 45 to 65 percent Lakoma soil and 30 to 40 percent Wewela soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. In places the depth to shale is 4 to 20 inches.

Typically, the surface layer of the Wewela soil is dark grayish brown and grayish brown fine sandy loam about 7 inches thick. The subsoil is about 22 inches thick. It is light olive brown. It is friable fine sandy loam in the upper part and firm clay in the lower part. The underlying material is light yellowish brown and yellow shaly silty clay. Multicolored, soft shale is at a depth of about 36 inches.

Included with these soils in mapping are small areas of Anselmo, Holt, and Vetal soils. These included soils make up less than 25 percent of any one mapped area. Anselmo soils are not underlain by clayey material. They are on low side slopes. Holt soils are 20 to 40 inches deep over sandstone. They are on some of the high parts of the landscape. Vetal soils are dark to a depth of more than 20 inches and are not underlain by clayey material. They are in swales.

Fertility and the content of organic matter are low in the Lakoma soil. Fertility is medium and the content of organic matter moderate in the Wewela soil. Tilth is poor in the Lakoma soil and good in the Wewela soil. Available water capacity is low in both soils. Permeability is slow in the Lakoma soil. It is moderate in the upper part of the Wewela soil and slow in the underlying material. Runoff is medium on both soils. The shrink-swell potential is high in the Lakoma soil and in the lower part of the Wewela soil.

Most of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion

and improve fertility and tilth are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping helps to control wind erosion.

These soils are suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, western wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Deferred grazing during wet periods helps to prevent surface compaction on the Lakoma soil.

These soils are suited to range. The native vegetation on the Lakoma soil dominantly is western wheatgrass and green needlegrass. That on the Wewela soil dominantly is bluestems, prairie sandreed, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges.

These soils are suited to windbreaks and environmental plantings, but the Lakoma soil takes in water slowly and has a clayey subsoil that can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely on the Lakoma soil. Planting on the contour helps to control erosion.

The Lakoma soil is in capability unit IIIe-4, Clayey range site; the Wewela soil is in capability unit IIIe-10, Sandy range site.

LwC—Lakoma-Wewela complex, 6 to 9 percent slopes. These moderately deep, well drained, moderately sloping soils are on uplands. The Lakoma soil is on ridges and the upper side slopes. The Wewela soil is on the lower slopes and in swales. Areas are irregular in shape. They are 50 to 65 percent Lakoma soil and 30 to 40 percent Wewela soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. In places the depth to shale is 4 to 20 inches.

Typically, the surface layer of the Wewela soil is dark grayish brown and grayish brown fine sandy loam about 7 inches thick. The subsoil is about 22 inches thick. It is light olive brown. It is friable fine sandy loam in the upper part and firm clay in the lower part. The underlying material is light yellowish brown and yellow shaly silty clay. Multicolored, soft shale is at a depth of about 36 inches.

Included with these soils in mapping are small areas of Anselmo, Holt, and Vetal soils. These included soils make up less than 20 percent of any one mapped area. Anselmo soils are not underlain by clayey material. They are on low side slopes. Holt soils are 20 to 40 inches deep over sandstone. They are on some of the high parts of the landscape. Vetal soils are dark to a depth of more than 20 inches and are not underlain by clayey material. They are in swales.

Fertility and the content of organic matter are low in the Lakoma soil. Fertility is medium and the content of organic matter moderate in the Wewela soil. Tilth is poor in the Lakoma soil and good in the Wewela soil. Available water capacity is low in both soils. Permeability is slow in the Lakoma soil. It is moderate in the upper part of the Wewela soil and slow in the underlying material. Runoff is medium on both soils. The shrink-swell potential is high in the Lakoma soil and in the lower part of the Wewela soil.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and improve fertility and tilth are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping helps to control wind erosion.

These soils are suited to tame pasture and hay. Alfalfa, western wheatgrass, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Deferred grazing during wet periods helps to prevent surface compaction on the Lakoma soil.

These soils are suited to range. The native vegetation on the Lakoma soil dominantly is western wheatgrass and green needlegrass. That on the Wewela soil dominantly is bluestems, prairie sandreed, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges.

These soils are suited to windbreaks and environmental plantings, but the Lakoma soil takes in water slowly and has a clayey subsoil that can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely on the Lakoma soil. Planting on the contour helps to control erosion.

The Lakoma soil is in capability unit IVe-4, Clayey range site; the Wewela soil is in capability unit IVe-8, Sandy range site.

MaD—Marlaville loam, 6 to 15 percent slopes. This shallow, well drained, moderately sloping and strongly sloping soil is on uplands. Areas generally are long and narrow. Slopes are convex.

Typically, the surface layer is grayish brown loam about 5 inches thick. The next 7 inches is light brownish gray, friable loam. The underlying material is light gray loam. White, soft siltstone is at a depth of about 18 inches. The soil is calcareous throughout. In some areas it contains more sand throughout and is underlain by sandstone. In other areas the depth to siltstone is more than 20 inches.

Fertility and the content of organic matter are low. Available water capacity also is low. Permeability is moderate. Runoff is rapid.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is little bluestem, big bluestem, and needleandthread. Overused areas are dominated by blue grama, sideoats grama, and sedges.

This soil generally is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIe-1; Shallow range site.

MaF—Mariaville loam, 15 to 40 percent slopes. This shallow, well drained, moderately steep and steep soil is on uplands. Areas are long and narrow or irregular in shape. Slopes are convex.

Typically, the surface layer is grayish brown loam about 5 inches thick. The next 7 inches is light brownish gray, friable loam. The underlying material is light gray loam. White, soft siltstone is at a depth of about 18 inches. The soil is calcareous throughout. In some areas it contains more sand throughout and is underlain by sandstone. In other areas the depth to siltstone is more than 20 inches.

Included with this soil in mapping are small areas of Labu and Okaton soils. These soils make up less than 15 percent of any one mapped area. They contain more clay throughout than the Mariaville soil. Also, they are lower on the landscape. Labu soils are moderately deep.

Fertility and the content of organic matter are low in the Mariaville soil. Available water capacity also is low. Permeability is moderate. Runoff is rapid.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is little bluestem, big bluestem, and needleandthread. Overused areas are dominated by blue grama, sideoats grama, needleandthread, and sedges.

This soil generally is too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-1; Shallow range site.

MdF—Mariaville-Labu-Anselmo complex, 15 to 40 percent slopes. These well drained, moderately steep and steep soils are on uplands. The shallow Mariaville soil and the deep Anselmo soil are on ridges and the upper side slopes. The moderately deep Labu soil is on the lower side slopes. Areas are long and narrow or irregular in shape. They are 35 to 50 percent Mariaville soil, 25 to 35 percent Labu soil, and 15 to 25 percent Anselmo soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Mariaville soil is grayish brown loam about 5 inches thick. The next 7 inches is light brownish gray, friable loam. The underlying material is light gray loam. White, soft siltstone is at a depth of about 18 inches. The soil is calcareous throughout. In some areas it contains more sand throughout and is underlain by sandstone. In other areas the depth to siltstone is more than 20 inches.

Typically, the surface layer of the Labu soil is grayish brown clay about 6 inches thick. The subsoil is grayish brown, firm and very firm clay about 15 inches thick. The underlying material is light brownish gray very shaly clay. Light brownish gray, soft shale is at a depth of about 30 inches. The soil is calcareous throughout. Accumulations of carbonate are in the subsoil and underlying material.

Typically, the surface layer of the Anselmo soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown and pale brown, very friable fine sandy loam about 15 inches thick. The underlying material is pale brown and light gray fine sandy loam. White, weakly consolidated sandstone is at a depth of about 48 inches. In some areas the depth to sandstone is 20 to 40 inches.

Included with these soils in mapping are small areas of Meadin, Okaton, and Sansarc soils. These included soils make up less than 25 percent of any one mapped area. Meadin soils are 8 to 20 inches deep over gravelly sand. They are on ridges. Okaton and Sansarc soils are less than 20 inches deep over shale. They are higher on the landscape than the Labu soil.

Fertility is low in the Mariaville and Labu soils and medium in the Anselmo soil. The content of organic matter is low in the Mariaville and Labu soils and moderate in the Anselmo soil. Available water capacity is low in the Mariaville and Labu soils and moderate in the Anselmo soil. Permeability is moderate in the Mariaville soil, slow in the Labu soil, and moderately rapid in the Anselmo soil. Runoff is rapid on all three soils. The shrink-swell potential is low in the Mariaville and Anselmo soils and very high in the Labu soil.

All of the acreage supports native grasses. These soils are suited to range. The native vegetation on the Mariaville and Anselmo soils dominantly is little bluestem, prairie sandreed, and needleandthread. That on the Labu soil dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama, sideoats grama, and western wheatgrass.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-1; the Mariaville soil is in Shallow range site, the Labu soil in Clayey range site, and the Anselmo soil in Sandy range site.

MeC—Meadin sandy loam, 3 to 9 percent slopes. This excessively drained, gently sloping and moderately sloping soil is on high terraces. It is shallow over gravelly sand. Areas are irregular in shape. Slopes are short and convex.

Typically, the surface soil is dark grayish brown, very friable sandy loam about 11 inches thick. The next 6 inches is dark brown loamy sand. The underlying material to a depth of 60 inches is multicolored gravelly coarse sand.

Included with this soil in mapping are small areas of Jansen and O'Neill soils. These soils make up less than 10 percent of any one mapped area. They are 20 to 40 inches deep over sand. They generally are on the higher, less sloping parts of the landscape.

Fertility and the content of organic matter are low in the Meadin soil. Available water capacity also is low. Permeability is rapid. Runoff is slow.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is blue grama, needleandthread, and prairie sandreed. Overused areas are dominated by blue grama and sedges.

This soil generally is too droughty for cultivated crops, tame pasture and hay, and windbreaks and envronmental plantings.

The capability unit is VIs-4; Shallow to Gravel range site.

MeE—Meadin sandy loam, 9 to 25 percent slopes. This excessively drained, strongly sloping and moderately steep soil is on high terraces. It is shallow over gravelly sand. Areas are irregular in shape. Slopes are short and convex.

Typically, the surface soil is dark grayish brown, very friable sandy loam about 11 inches thick. The next 6 inches is dark brown loamy sand. The underlying material to a depth of 60 inches is multicolored gravelly coarse sand.

Included with this soil in mapping are small areas of Jansen, O'Neill, and Sansarc soils. These soils make up less than 25 percent of any one mapped area. Jansen and O'Neill soils are 20 to 40 inches deep over sand. They are on the higher, less sloping parts of the landscape. Sansarc soils are 4 to 20 inches deep over shale. They generally are lower on the landscape than the Meadin soil.

Fertility and the content of organic matter are low in the Meadin soil. Available water capacity also is low. Permeability is rapid. Runoff is slow.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is blue grama, needleandthread, and prairie sandreed. Overused areas are dominated by blue grama and sedges. After continued overuse, sedges and forbs dominate the site.

This soil generally is too droughty and too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIs-4; Shallow to Gravel range site.

MoA—Millboro silty clay, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are slightly concave.

Typically, the surface soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Kolls and Witten soils. These soils make up less than 10 percent of any one mapped area. The poorly drained Kolls soils are in depressions. Witten soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Millboro soil. Tilth is poor. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops. Measures that control wind erosion, conserve moisture, and improve tilth are the main management needs. Examples are minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIs-3; Clayey range site.

MoB—Millboro silty clay, 2 to 6 percent slopes. This deep, well drained gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty

clay. In some areas the dark surface layer is less than 7 inches thick. In places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Kolls, Labu, Lakoma, and Witten soils. These soils make up less than 10 percent of any one mapped area. The poorly drained Kolls soils are in depressions. Labu and Lakoma soils are underlain by shale at a depth of 20 to 40 inches and have a dark surface layer that is less than 7 inches thick. They are in positions on the landscape similar to those of the Millboro soil. Witten soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Millboro soil. Tilth is poor. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops. Measures that control erosion, conserve moisture, and improve tilth are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4; Clayey range site.

MoC—Millboro silty clay, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In some areas the dark surface layer is less than 7 inches thick. In places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Labu, Lakoma, and Witten soils. These soils make up less than 10 percent of any one mapped area. Labu and Lakoma soils are underlain by shale at a depth of 20 to 40 inches and have a dark surface layer that is less than 7 inches thick. They are in positions on the landscape similar to those of the Millboro soil. Witten soils are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium and the content of organic matter moderate in the Millboro soil. Tilth is poor. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops. Measures that control erosion, conserve moisture, and improve tilth are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping helps to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4; Clayey range site.

MpB—Millboro-Lakoma silty clays, 2 to 6 percent slopes. These well drained, gently sloping soils are on uplands. The deep Millboro soil is on side slopes. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. The moderately deep Lakoma soil is on ridges. Areas are irregular in shape. They are 50 to 65 percent Millboro soil and 30 to 50 percent Lakoma soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Millboro soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In places the soil contains less clay throughout.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil

is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. The soil is calcareous throughout.

Included with these soils in mapping are small areas of Witten soils. These included soils make up less than 10 percent of any one mapped area. They are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium in the Millboro soil and low in the Lakoma soil. The content of organic matter is moderate in the Millboro soil and low in the Lakoma soil. Tilth is poor in both soils. Available water capacity is moderate in the Millboro soil and low in the Lakoma soil. Permeability is slow in both soils. Runoff is medium. The shrink-swell potential is very high in the Millboro soil and high in the Lakoma soil.

Most of the acreage is cropland. These soils are suited to cultivated crops, but the high content of lime in the surface layer of the Lakoma soil adversely affects the availability of plant nutrients. Measures that control erosion, conserve moisture, and improve fertility and tilth are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and deferring tillage when the soils are wet. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

These soils are suited to tame pasture and hay, but the high content of lime in the surface layer of the Lakoma soil adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

These soils are suited to range. The native vegetation on the Millboro soil dominantly is western wheatgrass and green needlegrass. That on the Lakoma soil dominantly is western wheatgrass, green needlegrass, sideoats grama, and bluestems. Overused areas are dominated by blue grama, western wheatgrass, and sedges.

These soils are suited to windbreaks and environmental plantings. They take in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. The low available water capacity and the high content of lime in the surface layer also are limitations in the Lakoma soil. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4; Clayey range site.

MpC—Millboro-Lakoma silty clays, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The deep Millboro soil is on side slopes. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. The moderately deep Lakoma soil is on ridges. Areas are irregular in shape. They are 45 to 55 percent Millboro soil and 35 to 45 percent Lakoma soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Millboro soil is dark grayish brown silty clay about 10 inches thick. The subsoil is grayish brown, firm and very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous silty clay. In places the soil contains less clay throughout.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. The soil is calcareous throughout.

Included with these soils in mapping are small areas of Witten soils. These included soils make up about 10 percent of any one mapped area. They are dark to a depth of more than 20 inches. They are in swales.

Fertility is medium in the Millboro soil and low in the Lakoma soil. The content of organic matter is moderate in the Millboro soil and low in the Lakoma soil. Tilth is poor in both soils. Available water capacity is moderate in the Millboro soil and low in the Lakoma soil. Permeability is slow in both soils. Runoff is medium. The shrink-swell potential is very high in the Millboro soil and high in the Lakoma soil.

About half of the acreage supports native grasses. These soils are suited to range. The native vegetation on the Millboro soil dominantly is western wheatgrass and green needlegrass. That on the Lakoma soil dominantly is western wheatgrass, green needlegrass, and bluestems. Overused areas are dominated by blue grama, western wheatgrass, and sedges.

These soils are suited to cultivated crops, but the high content of lime in the surface layer of the Lakoma soil adversely affects the availability of plant nutrients. Measures that control erosion, conserve moisture, and improve fertility and tilth are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and deferring tillage when the soils are wet. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

These soils are suited to tame pasture and hay, but the high content of lime in the surface layer of the Lakoma soil adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, western wheatgrass, intermediate wheatgrass, and smooth bromegrass. Deferred grazing during wet periods helps to prevent surface compaction.

These soils are suited to windbreaks and environmental plantings. They take in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. The low available water capacity and the high content of lime in the surface layer also are limitations in the Lakoma soil. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4; Clayey range site.

Mr—Mosher silt loam. This deep, moderately well drained, nearly level soil is on terraces and uplands. Areas are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is gray, very friable silt loam about 4 inches thick. The subsoil is about 13 inches thick. It is dark gray, very firm clay in the upper part and pale brown, firm clay loam in the lower part. It has accumulations of salts in the lower part. The upper part of the underlying material is light brownish gray, calcareous silty clay loam that has accumulations of salts. The lower part to a depth of 60 inches is light gray, calcareous sandy loam that has accumulations of carbonate. In some areas slopes are as much as 6 percent.

Included with this soil in mapping are small areas of Jerauld, Onita, Reliance, and Scott soils. These soils make up less than 25 percent of any one mapped area. Jerauld soils have visible salts within a depth of 16 inches. They are in slight depressions. Onita and Reliance soils do not have a sodium affected subsoil. Onita soils are in swales, and Reliance soils are on the higher parts of the landscape. The poorly drained Scott soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Mosher soil. The sodium in this soil adversely affects the growth of most plants. Tilth is poor. Available water capacity is moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is high in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops, but the clayey subsoil can restrict the penetration of plant roots. The best suited crops are those that are tolerant of drought and sodium salts. Early maturing small grain is better suited than corn. Measures that conserve moisture, increase the rate of water intake, and improve fertility are the main management needs. Examples are applying animal manure, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling increases the rate of water intake and improves tilth.

This soil is suited to tame pasture and hay. Only those species that can grow in a soil that has a claypan subsoil and contains sodium salts are suitable. Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are examples. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and blue grama. Overused areas are dominated by blue grama, buffalograss, and saltgrass.

This soil is suited to windbreaks and environmental plantings, but the dense claypan subsoil severely limits root penetration. Optimum growth, survival, and vigor are unlikely.

The capability unit is IVs-2; Claypan range site.

Ms—Mosher-Jerauld silt loams. These deep, moderately well drained, nearly level soils are on terraces and uplands. The Mosher soil is on small rises, and the Jerauld soil is in slight depressions. In most areas microrelief is pronounced. Areas are irregular in shape. They are 45 to 60 percent Mosher soil and 25 to 40 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Mosher soil is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is gray, very friable silt loam about 4 inches thick. The subsoil is about 13 inches thick. It is dark gray, very firm clay in the upper part and pale brown, firm clay loam in the lower part. It has accumulations of salts in the lower part. The upper part of the underlying material is light brownish gray, calcareous silty clay loam that has accumulations of salts. The lower part to a depth of 60 inches is light gray, calcareous sandy loam that has accumulations of carbonate.

Typically, the surface layer of the Jerauld soil is grayish brown, very friable silt loam about 3 inches thick. The subsoil is about 16 inches thick. The upper part is dark gray, firm clay. The lower part is gray, firm silty clay. It is calcareous and has accumulations of salts. The underlying material to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. It has gypsum crystals in the upper part.

Included with these soils in mapping are small areas of Onita, Reliance, and Scott soils. These included soils make up less than 15 percent of any one mapped area. Onita and Reliance soils do not have a sodium affected subsoil. Onita soils are in swales, and Reliance soils are on the higher parts of the landscape. The poorly drained Scott soils are in depressions.

Fertility is medium in the Mosher soil and low in the Jerauld soil. The content of organic matter is moderate

in the Mosher soil and low in the Jerauld soil. Tilth is poor in both soils. The sodium in these soils adversely affects the growth of most plants. Available water capacity is moderate in the Mosher soil and low or moderate in the Jerauld soil. Permeability is very slow in both soils. Runoff is slow. The shrink-swell potential is high in the subsoil.

Most of the acreage supports native grasses. These soils are suited to range, but the dense, compact subsoil limits productivity and the variety of suitable grasses. The native vegetation dominantly is western wheatgrass and blue grama. Blue grama is more prevalent on the Jerauld soil than on the Mosher soil. Overused areas are dominated by blue grama, buffalograss, and saltgrass. After continued overuse, many areas are bare. Restricted use during wet periods helps to prevent surface compaction and poor tilth.

This map unit is suited to tame pasture and hay, but very little production can be expected on the Jerauld soil. Alfalfa, crested wheatgrass, intermediate wheatgrass, and pubescent wheatgrass are the best suited species.

The Mosher soil is suited to cultivated crops, but crop growth is severely restricted because of the dense, sodium affected subsoil. No crops grow well on the Jerauld soil. Early maturing small grain is better suited than row crops. Measures that improve tilth are the main management needs. Examples are applying manure, including grasses and legumes in the cropping system, and subsoiling.

The Mosher soil is suited to windbreaks and environmental plantings, but the dense claypan subsoil severely limits root penetration. Windbreaks can be established, but optimum growth is unlikely. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil.

The Mosher soil is in capability unit IVs-2, Claypan range site; the Jerauld soil is in capability unit VIs-1, Thin Claypan range site.

ObE—Okaton-Lakoma silty clays, 15 to 50 percent slopes. These well drained, strongly sloping to very steep soils are on uplands. The shallow Okaton soil is on ridges and the upper side slopes. The moderately deep Lakoma soil is on the lower side slopes. Areas are irregular in shape. They are 50 to 75 percent Okaton soil and 15 to 40 percent Lakoma soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Okaton soil is light olive brown silty clay about 4 inches thick. The next 5 inches is pale yellow and light olive brown, friable silty clay. The underlying material is light yellowish brown very shaly clay. Pale yellow and light olive brown, soft shale is at a depth of about 15 inches. The soil is calcareous throughout. In places it contains more clay throughout.

Typically, the surface layer of the Lakoma soil is grayish brown silty clay about 6 inches thick. The subsoil is silty clay about 19 inches thick. It is light brownish gray and friable in the upper part and light yellowish brown and firm in the lower part. The underlying material is light yellowish brown and pale yellow shaly clay. Pale yellow and light gray, soft shale is at a depth of about 29 inches. Gypsum crystals and accumulations of carbonate are in the seams between the shale plates. The soil is calcareous throughout. In some areas the depth to shale is more than 40 inches. In places the soil contains more clay throughout and is not so friable.

Fertility and the content of organic matter are low in both soils. Available water capacity is very low in the Okaton soil and low in the Lakoma soil. Permeability is slow in both soils. Runoff is rapid. The shrink-swell potential is high.

Nearly all of the acreage supports native grasses. These soils are suited to range. The native vegetation dominantly is little bluestem, sideoats grama, and western wheatgrass. Rocky Mountain juniper and deciduous trees grow in many of the draws. They provide protection for livestock and wildlife. Overused areas are dominated by blue grama and sedges. After continued overuse, the plant cover is sparse and bare areas increase in extent.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-8; the Okaton soil is in Shallow range site, the Lakoma soil in Clayey range site.

OcF—Okaton-Mariaville complex, 15 to 50 percent slopes. These shallow, well drained, moderately steep to very steep soils are on uplands. The Okaton soil is on the lower side slopes. Boulders that range from 3 to more than 5 feet in diameter cover 25 to 45 percent of the surface (fig. 6). The Mariaville soil is on the higher convex parts of the landscape and in rimrock areas. Areas are irregular in shape. They are about 45 to 60 percent Okaton soil and 25 to 40 percent Mariaville soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Okaton soil is light olive brown bouldery silty clay about 4 inches thick. The next 5 inches is pale yellow and light olive brown, friable silty clay. The underlying material is light yellowish brown very shaly clay. Pale yellow and light olive brown, soft shale is at a depth of about 15 inches. The soil is calcareous throughout. In places it contains more clay throughout and is not so friable. In some areas the depth to shale is more than 20 inches.

Typically, the surface layer of the Mariaville soil is grayish brown loam about 5 inches thick. The next 7 inches is light brownish gray, friable loam. The underlying material is light gray loam. White, soft siltstone is at a depth of about 18 inches. The soil is calcareous

Figure 6.—Boulders in an area of Okaton-Mariaville complex, 15 to 50 percent slopes.

throughout. In places the depth to siltstone is more than 20 inches.

Included with these soils in mapping are small areas of Anselmo and Reliance soils. These included soils make up less than 15 percent of any one mapped area. The deep, loamy Anselmo soils are in areas below the Mariaville soil and above the Okaton soil. The deep, silty Reliance soils are in areas above the Mariaville soil.

Fertility and the content of organic matter are low in the Okaton and Mariaville soils. Available water capacity is very low in the Okaton soil and low in the Mariaville soil. Permeability is slow in the Okaton soil and moderate in the Mariaville soil. Runoff is rapid on both soils. The shrink-swell potential is high in the Okaton soil and low in the Mariaville soil.

All of the acreage supports native grasses. These soils are best suited to range. The native vegetation dominantly is little bluestem, sideoats grama, and western wheatgrass. Needleandthread grows on the Mariaville soil. Overused areas are dominated by blue grama, sideoats grama, and sedges.

These soils generally are too steep and too bouldery for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIs-6; Shallow range site.

OeC—O'Neill fine sandy loam, 3 to 9 percent slopes. This well drained, gently sloping and moderately sloping soil is on terraces. It is moderately deep over sandy material. Areas are irregular in shape. Slopes are short and convex.

Typically, the surface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown sandy loam about 6 inches thick. The subsoil is dark brown and brown, very friable sandy loam about 13 inches thick. The underlying material to a depth of 60 inches is multicolored sand and coarse sand.

Included with this soil in mapping are small areas of Jansen and Meadin soils. These soils make up less than 10 percent of any one mapped area. Jansen soils contain less sand and more clay in the upper part than the O'Neill soil. They are in swales and other concave

areas. Meadin soils are 8 to 20 inches deep over gravelly sand. They are on ridges.

Fertility is medium and the content of organic matter moderate in the O'Neill soil. Available water capacity is low. Permeability is moderately rapid in the subsoil and very rapid in the underlying material. Runoff is slow.

About half of the acreage is cropland. This soil generally is unsuited to cultivated crops. It is suited to tame pasture and hay, but productivity is limited because of droughtiness. Alfalfa, intermediate wheatgrass, and pubescent wheatgrass are examples of suitable pasture plants.

This soil is suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are dominated by needleandthread, blue grama, and sedges. After continued overuse, sedges and forbs dominate the site.

This soil is suited to windbreaks and environmental plantings, but droughtiness is a limitation. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is VIe-5; Sandy range site.

On—Onita silt loam. This deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface soil is dark gray, friable silt loam about 12 inches thick. The subsoil is about 26 inches thick. It is dark grayish brown and grayish brown, friable silty clay loam and firm silty clay. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay loam.

Included with this soil in mapping are small areas of Agar and Scott soils. These soils make up less than 10 percent of any one mapped area. Agar soils contain less clay in the subsoil than the Onita soil and are dark to a depth of less than 20 inches. They are on the high parts of the landscape. The poorly drained Scott soils are in depressions.

Fertility and the content of organic matter are high in the Onita soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is slow. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops. Measures that conserve moisture are the main management needs. Leaving crop residue on the surface is an example.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and green needlegrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is big bluestem, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass, Kentucky bluegrass, and sedges.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant moisture supply.

The capability unit is IIc-2; Silty range site.

Ot—Onita silt loam, occasionally flooded. This deep, moderately well drained, nearly level soil is in swales on uplands. It is occasionally flooded for brief periods in the spring. Areas are long and narrow. Slopes are smooth or slightly concave.

Typically, the surface soil is dark gray, friable silt loam about 12 inches thick. The subsoil is about 26 inches thick. It is dark grayish brown and grayish brown, friable silty clay loam and firm silty clay. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay loam. In places gravelly sand is at a depth of 26 to 40 inches.

Included with this soil in mapping are small areas of Bon, Mosher, Reliance, and Scott soils. These soils make up less than 10 percent of any one mapped area. Bon soils are stratified and contain less clay throughout than the Onita soil. They are on flood plains. Mosher soils have a sodium affected subsoil. They are in microdepressions. The well drained Reliance soils are higher on the landscape than the Onita soil. The poorly drained Scott soils are in depressions.

Fertility and the content of organic matter are high in the Onita soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. A seasonal high water table is at a depth of 2.5 to 6.0 feet during wet periods. Runoff is slow. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Measures that conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface is an example. In some years fieldwork is delayed because the soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

This soil is suited to range. The native vegetation dominantly is big bluestem, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass, Kentucky bluegrass, and sedges.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant moisture supply grow especially well.

The capability unit is IIc-3; Overflow range site.

Pg—Pits, gravel. These are open excavations, 5 to 50 feet deep, from which sand and gravel have been removed. They are irregular in shape. Slopes are uneven and broken. They range from nearly level on the pit

bottoms to almost vertical on the rims. Some of the pit bottoms are covered with water.

The pit bottoms typically are sand and gravel, but they are clay or clay loam where all of the sand and gravel has been removed. Mounds of mixed loamy overburden are on the edges of the excavations. The bottoms and sides support little or no vegetation during periods when the pits are mined.

Most gravel pits are used only as a source of sand and gravel for construction purposes. Some provide limited wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as topsoil dressing. Applying fertilizer as needed helps to establish range or pasture.

The capability unit is VIIIs-2; no range site is assigned.

Pm—Platte loam. This poorly drained, nearly level soil is on flood plains. In some areas it is dissected into small tracts by narrow channels. It is occasionally flooded. It is shallow over gravelly material. Areas are long and narrow. Slopes are smooth or slightly concave.

Typically, the surface layer is dark grayish brown, calcareous loam about 4 inches thick. The subsurface layer is dark grayish brown, friable loam about 5 inches thick. It has strata of fine sandy loam. The next 5 inches is dark gray, mottled sandy loam. The underlying material to a depth of 60 inches is multicolored gravelly coarse sand. In some areas adjacent to the channels, the soil is very poorly drained.

Included with this soil in mapping are small areas of Inavale and Whitelake soils. These soils make up less than 15 percent of any one mapped area. The somewhat excessively drained Inavale soils are on slight rises. Whitelake soils have a sodium affected subsoil. They are in positions on the landscape similar to those of the Platte soil.

In the Platte soil, fertility is medium and the content of organic matter is moderate. The available water capacity is low. Because of a seasonal high water table, however, the soil is not droughty. Permeability is moderate in the upper part of the soil and very rapid in the lower part. A seasonal high water table is at a depth of 1 to 2 feet much of the year. Runoff is slow.

Most of the acreage supports native grasses. This soil is best suited to range. The native vegetation dominantly is big bluestem, switchgrass, and indiangrass. Overused areas are dominated by Kentucky bluegrass and forbs.

This soil is poorly suited to cultivated crops and to tame pasture and hay because it is dissected into small tracts and has a seasonal high water table. It is suited to windbreaks and environmental plantings. The trees and shrubs that require an abundant moisture supply grow especially well. They can be planted by hand. In areas where the stream channels meander, however, they generally cannot be planted by machine.

The capability unit is IVw-2; Subirrigated range site.

PrA—Promise clay, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is dark grayish brown clay about 10 inches thick. It is calcareous in the lower part. The subsoil is dark grayish brown and grayish brown, very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay. In some areas the soil is dark to a depth of more than 20 inches. In other areas it contains less clay throughout. In places shale is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Carter, Hurley, Kolls, and Wendte soils. These soils make up less than 10 percent of any one mapped area. Carter and Hurley soils have a sodium affected subsoil. They are on flats. The poorly drained Kolls soils are in depressions. The moderately well drained Wendte soils are on narrow flood plains.

Fertility is medium and the content of organic matter moderate in the Promise soil. Tilth is poor. Available water capacity is moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that conserve moisture, improve tilth, and control wind erosion are the main management needs. Examples are minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIs-3; Clayey range site.

PrB—Promise clay, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2

inch to 2 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown clay about 10 inches thick. It is calcareous in the lower part. The subsoil is dark grayish brown and grayish brown, very firm clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay. In places, the dark surface layer is less than 7 inches thick and shale is at a depth of 20 to 40 inches. In some areas the soil is dark to a depth of more than 20 inches. In other areas it contains less clay throughout.

Included with this soil in mapping are small areas of Kolls and Wendte soils. These soils make up less than 10 percent of any one mapped area. The poorly drained Kolls soils are in depressions. The moderately well drained Wendte soils are on narrow flood plains.

Fertility is medium and the content of organic matter moderate in the Promise soil. Tilth is poor. Available water capacity is moderate. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that control erosion, conserve moisture, and improve tilth are the main management needs. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4; Clayey range site.

PrC—Promise clay, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas are 10 to 80 acres in size and are irregular in shape. Slopes are long and slightly convex.

Typically, the surface layer is dark grayish brown clay about 10 inches thick. It is calcareous in the lower part. The subsoil is dark grayish brown and grayish brown, very firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay. In places the soil is dark to a depth of more than 20 inches. In some areas, the dark surface layer is less than 7 inches thick and shale is at a depth of 20 to 40 inches. In other areas the soil contains less clay throughout.

Fertility is medium and the content of organic matter moderate. Tilth is poor. Available water capacity is moderate. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

About half of the acreage is cropland. This soil is suited to cultivated crops, but it is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that control erosion, conserve moisture, and improve tilth are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage. Chiseling or subsoiling improves tilth and increases the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion. Stripcropping helps to control wind erosion.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4; Clayey range site.

RaA—Ree loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown, very friable loam in the upper part; brown, friable clay loam in the next part; and pale brown, very friable loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous fine sandy loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more clay and less sand throughout. In places coarse sand is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These

soils make up less than 10 percent of any one mapped area.

In the Ree soil, fertility is medium and the content of organic matter is moderate. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface and minimizing tillage are examples.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIc-2; Silty range site.

RaB—Ree loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown, very friable loam in the upper part; brown, friable clay loam in the next part; and pale brown, very friable loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous fine sandy loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more clay and less sand throughout. In places coarse sand is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and control erosion are the main management needs in cultivated areas. Leaving crop residue on the surface is an example. Contour farming, grassed waterways, and terraces also help to control erosion.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Planting on the contour helps to control erosion.

The capability unit is IIe-1; Silty range site.

RaC—Ree loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown, very friable loam in the upper part; brown, friable clay loam in the next part; and pale brown, very friable loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous fine sandy loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more clay and less sand throughout. In places coarse sand is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay, but the slope is a limitation. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that control water erosion are the main management needs in cultivated areas. Including grasses and legumes in the cropping system and leaving crop residue on the surface are examples. Contour farming, grassed waterways, and terraces also help to control erosion.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Planting on the contour helps to control erosion.

The capability unit is IIIe-1; Silty range site.

RbA—Ree loam, gravelly substratum, 0 to 2 percent slopes. This well drained, nearly level soil is on uplands. It is 40 to 60 inches deep over gravelly sand. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 13 inches thick. The subsoil is about 32 inches thick. It is dark grayish brown, very friable clay loam in the upper part; brown, friable silty clay in the next part; and light yellowish brown, calcareous silty clay loam in the lower part. It has accumulations of carbonate in the lower part. The underlying material to a depth of 60 inches is multicolored gravelly sand. In some areas the depth to gravelly sand is more than 60 inches. In places coarse sand is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Brocksburg and Onita soils. These soils make up less than 15 percent of any one mapped area. Brocksburg soils are 20 to 40 inches deep over gravelly sand and are dark to a depth of more than 20 inches. The moderately well drained Onita soils are in swales.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is moderate. Permeability is moderate or moderately slow in the subsoil and rapid in the underlying material. Runoff is slow. The shrink-swell potential is high in the subsoil.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, crested wheatgrass, intermediate wheatgrass, and green needlegrass are examples of suitable pasture plants. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by western wheatgrass, blue grama, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant moisture supply, all climatically suited trees and shrubs grow well.

The capability unit is IIc-2; Silty range site.

RcC—Ree-Tassel complex, 3 to 9 percent slopes. These well drained, gently sloping and moderately sloping soils are on uplands. The deep Ree soil is on the less sloping side slopes. The shallow Tassel soil is on knolls and ridges. Areas are irregular in shape. They are 70 to 85 percent Ree soil and 15 to 25 percent Tassel soil. The two soils occur as areas so closely intermingled or so small that mapping them separately was not practical.

Typically, the surface layer of the Ree soil is dark grayish brown loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown, very friable loam in the upper part; brown, friable clay loam in the next part; and pale brown, very friable loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous fine sandy loam. It has accumulations of carbonate in the upper part.

Typically, the surface layer of the Tassel soil is grayish brown fine sandy loam about 7 inches thick. The underlying material is light gray fine sandy loam. Pale yellow sandstone is at a depth of about 14 inches. The soil is calcareous throughout. In places it contains more silt and less sand.

Included with these soils in mapping are small areas of Anselmo and Holt soils. These included soils make up less than 10 percent of any one mapped area. They contain more sand and less clay throughout than the Ree soil. They are in positions on the landscape similar to those of the Ree soil.

Fertility is medium and the content of organic matter moderate in the Ree soil. Fertility and the content of organic matter are low in the Tassel soil. Tilth is good in the Ree soil and poor in the Tassel soil. Available water capacity is high in the Ree soil and very low in the Tassel soil. Permeability is moderate in the Ree soil and moderately rapid in the Tassel soil. Runoff is medium on both soils. The shrink-swell potential is moderate in the subsoil of the Ree soil.

Most of the acreage is cropland. This map unit is suited to cultivated crops. No crops grow well, however, on the Tassel soil. Measures that control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces also help to control water erosion.

This map unit is suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass can be grown on the Ree soil, but very little production can be expected on the Tassel soil.

These soils are suited to range, but productivity is limited on the Tassel soil. The native vegetation on the Ree soil dominantly is western wheatgrass and green needlegrass. That on the Tassel soil dominantly is little bluestem, sideoats grama, and blue grama. Overused areas are dominated by needleandthread, blue grama, and sedges.

The Ree soil is suited to windbreaks and environmental plantings, but the Tassel soil generally is unsuited. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well on the Ree soil. No trees or shrubs grow well on the Tassel soil. Planting on the contour helps to control erosion.

Figure 7.—An area of Reliance silty clay loam, 0 to 3 percent slopes, used for tame hay.

The Ree soil is in capability unit IIIe-2, Silty range site; the Tassel soil is in capability unit VIe-10, Shallow range site.

ReA—Reliance silty clay loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm and friable silty clay loam about 26 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown and brown, calcareous silty clay loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more clay throughout. In other areas it contains less clay and more sand throughout.

Included with this soil in mapping are small areas of Onita and Scott soils. These soils make up less than 15 percent of any one mapped area. The moderately well drained Onita soils are in swales. The poorly drained Scott soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is slow. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay (fig. 7). Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface is an example.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIc-2; Silty range site.

ReB—Reliance silty clay loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm and friable silty clay loam about 26 inches thick. In the lower part it is calcareous and has accumulations of carbonates. The underlying material to a depth of 60 inches is pale brown and brown, calcareous silty clay loam. It has accumulations of carbonate in the upper part. In some areas the soil contains less clay and more sand throughout. In other areas it contains more clay throughout. In places the surface layer is less than 5 inches thick.

Included with this soil in mapping are small areas of Onita and Scott soils. These soils make up less than 10 percent of any one mapped area. The moderately well drained Onita soils are in swales. The poorly drained Scott soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and control erosion are the main management needs in cultivated areas. Leaving crop residue on the surface is an example. Contour farming, grassed waterways, and terraces also help to control water erosion (fig. 8).

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Planting on the contour helps to control erosion.

The capability unit is IIe-1; Silty range site.

ReB2—Reliance silty clay loam, 2 to 6 percent slopes, eroded. This deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are convex.

Typically, the surface layer is brown silty clay loam about 5 inches thick. The subsoil is grayish brown and light brownish gray, very friable and friable silty clay loam about 20 inches thick. It has spots and streaks of lime in the lower part. The underlying material to a depth of 60

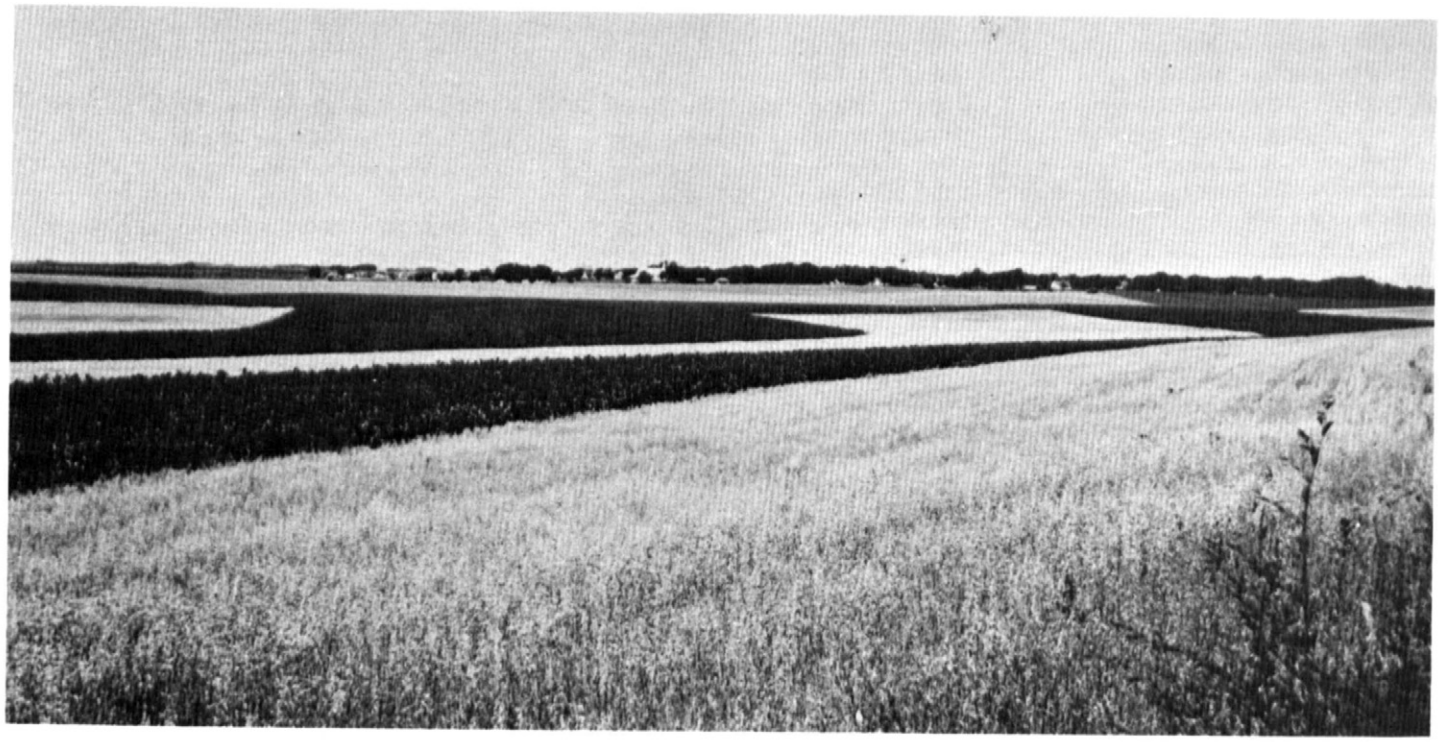


Figure 8.—Small grain and corn planted on the contour in an area of Reliance silty clay loam, 3 to 6 percent slopes.

inches is pale yellow and light yellowish brown silty clay loam. It has accumulations of carbonate in the upper part. The soil is calcareous throughout. In places it contains more clay throughout. In some areas, the surface layer is thicker and free carbonates are leached below a depth of 18 inches.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility and the content of organic matter are low in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops, but the high content of lime in the surface layer adversely affects the availability of plant nutrients. Measures that control erosion, improve fertility, and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces also help to control water erosion.

This soil is suited to tame pasture and hay, but productivity is limited because of the high content of lime in the surface layer. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, little bluestem, and sideoats grama. Overused areas are dominated by sideoats grama, blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings, but the high content of lime in the surface layer adversely affects the availability of plant nutrients. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-2; Silty range site.

ReC—Reliance silty clay loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are elongated and irregular in shape. Most occur as small ridges that are dissected by shallow drainageways. Slopes are smooth and convex.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm and friable silty clay loam about 26 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown and brown, calcareous silty clay loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more clay throughout. In other areas it contains less clay and more sand throughout. In places the surface layer is less than 5 inches thick.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that control water erosion are the main management needs in cultivated areas. Including grasses and legumes in the cropping system and leaving crop residue on the surface are examples. Contour farming, grassed waterways, and terraces also help to control water erosion.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Planting on the contour helps to control erosion.

The capability unit is IIIe-1; Silty range site.

ReC2—Reliance silty clay loam, 6 to 9 percent slopes, eroded. This deep, well drained, moderately sloping soil is on uplands. Areas are irregular in shape. Slopes are convex.

Typically, the surface layer is brown silty clay loam about 5 inches thick. The subsoil is grayish brown and light brownish gray, very friable and friable silty clay loam about 20 inches thick. It has spots and streaks of lime in the lower part. The underlying material to a depth of 60 inches is pale yellow and light yellowish brown silty clay loam. It has accumulations of carbonate in the upper part. The soil is calcareous throughout. In places it contains more clay throughout. In some areas, the surface layer is thicker and free carbonates are leached below a depth of 18 inches.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility and the content of organic matter are low in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage is cropland. This soil is suited to cultivated crops, but the high content of lime in the surface layer adversely affects the availability of plant nutrients. Measures that control erosion, improve fertility, and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces also help to control water erosion.

This soil is suited to tame pasture and hay, but productivity is limited because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, little bluestem, and sideoats grama. Overused areas are dominated by sideoats grama, blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings, but the high content of lime in the surface layer adversely affects the availability of plant nutrients. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-1; Silty range site.

ReD—Reliance silty clay loam, 9 to 15 percent slopes. This deep, well drained, strongly sloping soil is on uplands. Areas are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm and friable silty clay loam about 26 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown and brown, calcareous silty clay loam. It has accumulations of carbonate in the upper part. In some areas the soil contains more sand and less clay throughout. In other areas it contains more clay throughout. In places the surface layer is less than 5 inches thick.

Included with this soil in mapping are small areas of the moderately well drained Onita soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is rapid. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay, but the slope is a limitation. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that control erosion are the main management needs in cultivated areas. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples. Contour farming, grassed waterways, and terraces also help to control water erosion.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and needleandthread. Overused areas are dominated by blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and sedges dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well. Planting on the contour helps to control erosion.

The capability unit is IVe-1; Silty range site.

ReD2—Reliance silty clay loam, 9 to 15 percent slopes, eroded. This deep, well drained, strongly sloping soil is on uplands. Areas are irregular in shape. Slopes are convex.

Typically, the surface layer is brown silty clay loam about 5 inches thick. The subsoil is grayish brown and light grayish brown, very friable and friable silty clay loam about 20 inches thick. It has spots and streaks of lime in the lower part. The underlying material to a depth of 60 inches is pale yellow and light yellowish brown silty clay loam. It has accumulations of carbonate in the upper part. The soil is calcareous throughout. In places it contains more clay throughout. In some areas, the surface layer is thicker and free carbonates are leached below a depth of 18 inches.

Included with this soil in mapping are small areas of Labu and Onita soils. These soils make up less than 10 percent of any one mapped area. Labu soils are 20 to 40 inches deep over shale. They are on low side slopes. The moderately well drained Onita soils are in swales.

Fertility and the content of organic matter are low in the Reliance soil. Tilth is good. Available water capacity is high. Permeability is moderately slow. Runoff is rapid. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Although about half of the acreage is cropland, this soil generally is not suited to cultivated crops, mainly because of the slope and a severe erosion hazard. It is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, little bluestem, and sideoats grama. Overused areas are dominated by sideoats grama, blue grama, western wheatgrass, and sedges. After continued overuse, Kentucky bluegrass and sedges dominate the site.

This soil is suited to windbreaks and environmental plantings, but the high content of lime in the surface

layer adversely affects the availability of plant nutrients. Trees and shrubs can be established in selected areas, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is VIe-3; Silty range site.

Rv—Riverwash. This map unit consists of nearly level to hummocky, very poorly drained to excessively drained, unstabilized sandy sediments stratified with silty and clayey material. It occurs as sandbars adjacent to the Missouri River and as a small island. It is flooded only when a large amount of water is released from Fort Randall Dam. A seasonal high water table fluctuates between the surface and a depth of 1 foot in the nearly level areas and is as deep as 6 feet or more in the hummocky areas.

Most of the acreage is used as habitat for wildlife. Most areas support little or no vegetation, but cottonwood trees grow in some areas.

The capability unit is VIIIe-1; no range site is assigned.

ScE—Sansarc-Rock outcrop complex, 9 to 40 percent slopes. This strongly sloping to steep map unit occurs as areas of a shallow, well drained Sansarc soil intermingled with areas where shale crops out. It is on breaks along the Missouri River. The Sansarc soil is on the upper side slopes and ridges. The Rock outcrop is on convex slopes below the Sansarc soil. Areas are long and irregular in shape. They are 55 to 65 percent Sansarc soil and 20 to 35 percent Rock outcrop. The Sansarc soil and the Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sansarc soil is dark grayish brown, calcareous clay about 4 inches thick. The underlying material is grayish brown and light olive gray, calcareous clay and shaly clay. Light olive gray, soft shale is at a depth of about 18 inches.

The Rock outcrop is gray, soft shale.

Included with the Sansarc soil and Rock outcrop in mapping are small areas of Labu soils and, along narrow drainageways, soils that are similar to Labu soils but have a higher content of salts throughout. Included soils make up less than 5 percent of any one mapped area. Labu soils are more than 20 inches deep over shale. They are in the less sloping areas.

Fertility and the content of organic matter are low in the Sansarc soil. Available water capacity is very low. Permeability is slow. The shrink-swell potential is very high.

In all areas the Sansarc soil supports native grasses. It is suited to range. The native vegetation dominantly is little bluestem, western wheatgrass, and sideoats grama. Overused areas are dominated by western wheatgrass, blue grama, and sedges. The Rock outcrop does not support vegetation.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Sansarc soil is in capability unit VIIe-8, Shallow Clay range site; the Rock outcrop is in capability unit VIIIs-2 and is not assigned to a range site.

So—Scott silt loam. This deep, poorly drained, nearly level soil is in depressions in the uplands. It is ponded during periods of snowmelt or heavy rainfall. Areas are oval or oblong.

Typically, the surface soil is gray, very friable and friable silt loam about 9 inches thick. The subsoil is very dark gray, dark gray, and gray, very firm and firm clay about 23 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray and light brownish gray, calcareous silty clay loam. In places the soil is somewhat poorly drained.

Included with this soil in mapping are small areas of the moderately well drained Onita and well drained Reliance soils. These soils make up less than 15 percent of any one mapped area. They are slightly higher on the landscape than the Scott soil.

Fertility is medium and the content of organic matter moderate in the Scott soil. Tilth is fair. Available water capacity is moderate. Permeability is very slow in the subsoil and moderate in the underlying material. A seasonal high water table is within a depth of 1.0 foot in the spring of most years. As much as 0.5 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high in the subsoil and moderate in the underlying material.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is western wheatgrass, big bluestem, and sedges. Overused areas are dominated by blue grama, buffalograss, and sedges. The soil is an excellent site for stock water dugouts.

Unless drained, this soil is poorly suited to cultivated crops and generally unsuited to windbreaks and environmental plantings. The best suited crops are those that mature late in the growing season. The main concern of management is improving drainage. In undrained areas, crops are likely to drown out and tillage usually is delayed for long periods.

This soil is suited to tame pasture and hay, but only the water-tolerant pasture plants grow well in undrained areas. Garrison creeping foxtail and reed canarygrass are the best suited species. All climatically suited pasture plants grow well in drained areas. Deferred grazing during wet periods helps to prevent surface compaction.

The capability unit is IVw-1; Closed Depression range site.

TrE—Tassel-Rock outcrop complex, 9 to 30 percent slopes. This strongly sloping to steep map unit occurs as areas of a shallow, well drained Tassel soil

intermingled with areas where sandstone crops out. The Tassel soil is on side slopes. The Rock outcrop is on the upper convex slopes. Areas are irregular in shape. They are 65 to 80 percent Tassel soil and 10 to 30 percent Rock outcrop. The Tassel soil and the Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Tassel soil is grayish brown fine sandy loam about 7 inches thick. The underlying material is light gray fine sandy loam. Pale yellow, weakly consolidated sandstone is at a depth of about 14 inches. The soil is calcareous throughout. In some areas the depth to sandstone is more than 20 inches.

The Rock outcrop is weakly cemented to strongly cemented sandstone.

Included with the Tassel soil and Rock outcrop in mapping are small areas of Anselmo and Holt soils. These included soils make up less than 10 percent of any one mapped area. They are more than 20 inches deep over sandstone. They are on low side slopes.

Fertility and the content of organic matter are low in the Tassel soil. Available water capacity is very low. Permeability is moderately rapid. Runoff is rapid.

In all areas the Tassel soil supports native grasses. It is suited to range. The native vegetation dominantly is little bluestem, sideoats grama, and blue grama. Overused areas are dominated by blue grama, needleandthread, and sedges. The Rock outcrop does not support vegetation.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Tassel soil is in capability unit VIe-10, Shallow range site; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site.

UlA—Uly silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is dark grayish brown and brown, very friable silt loam about 22 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. It has accumulations of carbonate. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Coly and Onita soils. These soils make up less than 15 percent of any one mapped area. Coly soils are on the steeper parts of the landscape. Their surface layer is thinner than that of the Uly soil. The moderately well drained Onita soils are in swales.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Leaving crop residue on the surface is an example.

This soil is suited to native grasses, but very few areas are used for range. The native vegetation dominantly is big bluestem and green needlegrass. Overused areas are dominated by western wheatgrass, needleandthread, and blue grama. After continued overuse, Kentucky bluegrass and weeds dominate the site.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIc-2; Silty range site.

UlB—Uly silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is dark grayish brown and brown, very friable silt loam about 22 inches thick. In the lower part it is calcareous and has accumulations of carbonate. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. It has accumulations of carbonate. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Coly and Onita soils. These soils make up less than 15 percent of any one mapped area. Coly soils are on the steeper parts of the landscape. Their surface layer is thinner than that of the Uly soil. The moderately well drained Onita soils are in swales.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and control erosion are the main management needs in cultivated areas. Including grasses and legumes in the cropping system and leaving crop residue on the surface are examples. Contour farming, grassed waterways, and terraces also help to control erosion.

This soil is suited to native grasses, but very few areas are used for range. The native vegetation dominantly is green needlegrass and big bluestem. Overused areas are dominated by western wheatgrass, needleandthread, and blue grama.

This soil is suited to windbreaks and environmental plantings. Except for the species that require an abundant supply of moisture, all climatically suited trees and shrubs grow well.

The capability unit is IIe-1; Silty range site.

VaC—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, excessively drained, undulating and gently rolling soil is on uplands. Areas are irregular in shape. Slopes are short and convex.

Typically, the surface layer is grayish brown loamy fine sand about 6 inches thick. The next 7 inches also is grayish brown loamy fine sand. The underlying material to a depth of 60 inches is pale brown and very pale brown fine sand.

Included with this soil in mapping are small areas of Anselmo, Dunday, Holt, and Tassel soils. These soils make up less than 15 percent of any one mapped area. Anselmo and Dunday soils are dark to a depth of more than 7 inches. They are on the low parts of the landscape. Holt and Tassel soils are on the high parts of the landscape. Holt soils are 20 to 40 inches deep over sandstone. Tassel soils are 6 to 20 inches deep over sandstone.

Fertility and the content of organic matter are low in the Valentine soil. Available water capacity also is low. Permeability is rapid. Runoff is slow.

Most of the acreage supports native grasses. The soil is suited to range. The native vegetation dominantly is little bluestem, sand bluestem, and prairie sandreed. Overused areas are dominated by sand dropseed, needleandthread, and weeds. If overuse continues, sand blowouts are more likely to form along livestock trails and around watering facilities.

This soil generally is unsuited to cultivated crops and to tame pasture and hay because it is droughty and is highly susceptible to wind erosion. It is suited to windbreaks and environmental plantings, but only evergreens can be successfully established.

The capability unit is VIe-7; Sands range site.

VaD—Valentine loamy fine sand, 9 to 18 percent slopes. This deep, excessively drained, rolling and hilly soil is on uplands. Areas are irregular in shape.

Typically, the surface layer is grayish brown loamy fine sand about 6 inches thick. The next 7 inches also is grayish brown loamy fine sand. The underlying material to a depth of 60 inches is pale brown and very pale brown fine sand.

Included with this soil in mapping are small areas of Dunday and Tassel soils. These soils make up less than 15 percent of any one mapped area. Dunday soils are dark to a depth of more than 7 inches. They are on the low parts of the landscape. Tassel soils are 6 to 20 inches deep over sandstone. They are on the high parts of the landscape.

Fertility and the content of organic matter are low in the Valentine soil. Available water capacity also is low. Permeability is rapid. Runoff is slow.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is little bluestem, sand bluestem, and prairie sandreed. Overused areas are dominated by blue grama, sand dropseed, and weeds. If overuse continues, sand blowouts are more likely to form along livestock trails and around watering facilities.

This soil generally is unsuited to cultivated crops and to tame pasture and hay because it is droughty and is highly susceptible to wind erosion. It is suited to windbreaks and environmental plantings, but only evergreens can be successfully established. Planting the trees and shrubs directly in sod helps to control wind erosion.

The capability unit is VIe-7; Sands range site.

Vt—Vetal fine sandy loam. This deep, well drained, nearly level soil is in swales on uplands. It is occasionally flooded for very brief periods in the spring. Areas are long and narrow or irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface soil is dark grayish brown fine sandy loam about 23 inches thick. The next 12 inches is dark grayish brown and grayish brown, very friable sandy loam. The underlying material to a depth of 60 inches is brown sandy loam. In places the soil is dark to a depth of less than 20 inches.

Included with this soil in mapping are small areas of the somewhat excessively drained Dunday soils. These soils make up less than 10 percent of any one mapped area. They are higher on the landscape than the Vetal soil.

Fertility and the content of organic matter are high in the Vetal soil. Available water capacity is moderate. Permeability is moderately rapid. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Measures that conserve moisture and control wind erosion are the main management needs in cultivated areas. Leaving crop residue on the surface is an example. Stripcropping and field windbreaks also help to control wind erosion.

This soil is suited to range. The native vegetation dominantly is prairie sandreed, needleandthread, bluestems, and switchgrass. Overgrazed areas are dominated by blue grama and sand dropseed.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant moisture supply grow especially well.

The capability unit is IIIe-7; Sandy range site.

Wd—Wendte silty clay. This deep, moderately well drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are irregular in shape.

Typically, the surface layer is grayish brown, calcareous silty clay about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown, pale brown, and light brownish gray, stratified, calcareous silty clay and silty clay loam. In some areas below Fort Randall Dam, stratified silt loam and very fine sandy loam are between depths of 20 and 60 inches. In others the surface layer is silt loam.

Included with this soil in mapping are small areas of Haynie Variant soils. These soils make up less than 10 percent of any one mapped area. They contain less clay throughout than the Wendte soil. They are on slight rises.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Tilth is poor. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops. In most years, however, fieldwork is delayed because of the wetness caused by runoff from adjacent soils. Measures that conserve moisture and improve tilth are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are intermediate wheatgrass, smooth bromegrass, western wheatgrass, and alfalfa. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and big bluestem. Overused areas are dominated by blue grama and sedges.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIs-3; Clayey Overflow range site.

We—Wendte silty clay, channeled. This deep, moderately well drained, nearly level soil is on flood plains that are dissected by narrow channels. It is frequently flooded. Areas are long and narrow.

Typically, the surface layer is grayish brown, calcareous silty clay about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown, pale brown, and light brownish gray, stratified, calcareous silty clay and silty clay loam.

Included with this soil in mapping are small areas of Promise and Witten soils. These soils make up about 10 percent of any one mapped area. They are not stratified. They are higher on the landscape than the Wendte soil.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is western wheatgrass, green needlegrass, and big bluestem. Overused areas are dominated by blue grama and sedges. Deciduous trees and shrubs grow along some channels. They provide protection for livestock and wildlife.

Because of the small size of each tract and the flooding in spring, this soil generally is unsuited to cultivated crops. It is suited to tame pasture and hay, but harvesting hay is difficult because of the channeled landscape. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to windbreaks and environmental plantings. Because of the meandering stream channels, the trees and shrubs generally cannot be planted by machine.

The capability unit is VIw-1; Clayey Overflow range site.

Wh—Whitelake fine sandy loam. This deep, moderately well drained, nearly level soil is on uplands. Areas are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is very dark grayish brown fine sandy loam about 13 inches thick. The subsurface layer is grayish brown, very friable fine sandy loam about 2 inches thick. The subsoil is about 20 inches thick. It is grayish brown and light brownish gray, friable fine sandy loam in the upper part; brown, firm, calcareous sandy clay loam in the next part; and yellowish brown, friable, calcareous fine sandy loam in the lower part. The underlying material to a depth of 60 inches is pale yellow and light gray, calcareous fine sandy loam and very fine sandy loam.

Included with this soil in mapping are small areas of Anselmo and Cass soils. These soils make up less than 10 percent of any one mapped area. They do not have a sodium affected subsoil. Anselmo soils are on the high parts of the landscape. Cass soils are along narrow drainageways.

Fertility is medium and the content of organic matter moderate in the Whitelake soil. Tilth is good. The sodium in this soil adversely affects the growth of most cultivated crops. Available water capacity is moderate. Permeability is slow in the subsoil and moderately rapid in the underlying material. A seasonal high water table is at a depth of 2 to 4 feet during wet periods. Runoff is slow.

Most of the acreage supports native grasses. This soil is suited to range. The native vegetation dominantly is prairie sandreed and needleandthread. Overused areas are dominated by needleandthread, blue grama, and sedges.

This soil is suited to cultivated crops, but wind erosion is a hazard. Measures that control wind erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Stripcropping and field windbreaks also help to control wind erosion.

Seeding this soil to suitable tame pasture plants is effective in controlling erosion. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable species. A mulch of crop residue helps to control wind erosion until the pasture plants are established.

This soil is suited to windbreaks and environmental plantings. Preparing the soil for planting in the spring helps to control wind erosion.

The capability unit is IVe-13; Sandy range site.

Wn—Witten silty clay. This deep, moderately well drained, nearly level soil is in swales on uplands. It is occasionally flooded for very brief periods. When dry, it is characterized by cracks, which are 1/2 inch to 2 inches wide and several feet long and extend through the subsoil. Areas generally are long and narrow. Slopes are slightly concave.

Typically, the surface soil is dark gray, firm silty clay about 11 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm, calcareous clay about 28 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay. In some areas the soil contains more clay throughout.

Fertility and the content of organic matter are high. Tilth is poor. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shink-swell potential is very high.

Most of the acreage is cropland. This soil is suited to cultivated crops. In some years, however, fieldwork is delayed because of the wetness caused by runoff from adjacent soils. Measures that conserve moisture and improve tilth are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, western wheatgrass, intermediate wheatgrass, and smooth bromegrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama, buffalograss, and sedges.

This soil is suited to windbreaks and environmental plantings. Optimum growth is unlikely, however, because the clayey subsoil can restrict the penetration of plant roots.

The capability unit is IIIs-3; Clayey range site.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber or is available for those uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops.

Prime farmland has an adequate and dependable supply of moisture. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 17,090 acres in Gregory County, or 3 percent of the total land area, meets the requirements for prime farmland. About 180,370 additional acres would meet the requirements for prime farmland if irrigated. The main crops grown on this land are corn, sorghum, oats, alfalfa, and wheat.

The map units in Gregory County that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Nearly all of the soils listed in table 5 have a limited supply of moisture. They qualify for prime farmland only in areas where this limitation has been overcome by

irrigation. The need for irrigation is indicated in parentheses after the soil names. Onsite investigation is needed to determine whether or not a specific area of these soils is irrigated.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Kerry R. Stiner, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 53 percent of the acreage in Gregory County is used for cultivated crops or for tame pasture and hay (*11*). The major crops are alfalfa, corn, oats, grain sorghum, and wheat. Barley, rye, and sunflowers also are grown. Corn is grown for grain and silage, oats and sorghum for grain, and alfalfa mainly for hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are grown as tame pasture plants. Alfalfa seed also is harvested as a cash crop.

The potential of the soils in the county for increased crop production is good. About 23,600 acres of potentially good cropland is currently used as range, 2,500 acres as pasture, and 18,000 acres as hayland (*10*). Food production could be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion reduces productivity and results in sedimentation. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Boro and Coly soils. Erosion also reduces the productivity of soils that tend to be droughty, such as Labu and Lakoma soils. When erosion occurs, sediment rich in nutrients enters streams and lakes. Measures that control erosion minimize the pollution of streams and lakes by sediment and preserve water quality for fish and wildlife, recreation, and municipal use. They also reduce the amount of fertilizer needed in cropped areas and prevent the removal of plant nutrients.

A cropping system that keeps a plant cover on the surface for extended periods holds soil losses to an amount that does not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase

the infiltration rate, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and the runoff rate and help to control erosion. They are most practical on deep, well drained soils that have long, smooth slopes. Some soils, such as Labu and Lakoma, are poorly suited to terraces and diversions because of short, irregular slopes and the underlying bedrock, which could be exposed in terrace channels.

Wind erosion is a slight to severe hazard on many of the soils in the county. The hazard is especially severe on Anselmo, Dunday, and Holt soils. Wind erosion can damage these soils in a few hours if winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. An adequate plant cover, a cover of crop residue, and a rough surface help to control wind erosion. Windbreaks of suitable trees and shrubs also are effective.

Information about the measures that control erosion on each kind of soil is contained in the Technical Guide, available in the local office of the Soil Conservation Service.

Soil fertility helps to determine the yields that can be obtained from the soil. It can be improved by applying fertilizer and by including grasses and legumes in the cropping system. The kinds and amounts of fertilizer needed on Lakoma and other soils that have a high content of lime in the surface layer generally differ from the kinds and amounts needed on soils that do not have lime in the surface layer. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected yield level. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. In Millboro, Promise, and Witten soils, tilth is poor. These soils dry out slowly in the spring and cannot be easily tilled when dry. If they are farmed when wet, they tend to be cloddy when dry. As a result of the cloddiness, preparing a seedbed is difficult. Timely tillage, inclusion of grasses and legumes in the cropping system, and incorporation of crop residue into the soil improve tilth and increase the rate of water intake.

Field crops suited to the soils and climate of the survey area include close-grown crops and row crops. Oats and wheat are the main close-grown crops. Corn and sorghum are the main row crops.

The deep, well drained or moderately well drained soils are suited to all of the crops commonly grown in the county. Examples are Agar, Bon, Onita, Ree, and Reliance soils. O'Neill and other droughty soils are better suited to early maturing small grain than to deeper rooted crops, such as corn and alfalfa, because the porous underlying material limits the depth to which roots can penetrate and the available water capacity. Anselmo, Holt, and other soils that are susceptible to wind erosion are better suited to close-grown crops than to other crops.

Many of the deep, well drained soils are suited to irrigation. Examples are Agar, Jansen, Ree, and Reliance soils. The main concerns of management are conserving moisture, improving fertility and tilth, and, on soils that have a slope of more than 2 percent, controlling erosion. The quality of the irrigation water is a concern if water from a well is used. The best water has a low content of salts and sodium.

Pasture plants best suited to the climate and most of the soils in the survey area include alfalfa, intermediate wheatgrass, and smooth bromegrass. Because of the hazard of erosion, bunchgrasses, such as crested wheatgrass, should not be planted in areas where the slope is more than 6 percent. On the poorly drained Fedora, Kolls, and Scott soils, the choice of pasture plants is limited to water-tolerant species, such as Garrison creeping foxtail and reed canarygrass.

If the pasture is overgrazed, the desirable grasses lose vigor and die and usually are replaced by annual grasses and weeds. Proper stocking rates, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. The capability classification of each soil also is shown. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed

because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*8*). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 6.

Rangeland

Kerry R. Stiner, district conservationist, helped prepare this section.

About 45 percent of the acreage of Gregory County is rangeland. Most of the rangeland occurs as large tracts of the Labu, Lakoma, Okaton, and Sansarc soils on the breaks along the Missouri River. Some of the rangeland occurs as areas of the Anselmo, Holt, Meadin, and Tassel soils in the southwestern part of the county. Most of these soils are too steep or too shallow for cultivated crops. Native hay is harvested from about 25,000 acres.

About 50 percent of the local farm income is derived from the sale of cattle. Cow-calf enterprises are common throughout the county. There are a number of cow-calf-yearling enterprises. The range generally is grazed from late in spring to early in fall. On many farms and ranches, the forage produced on rangeland is supplemented with crop aftermath. In winter and early in spring, livestock are fed native hay or tame hay. In fall and winter, the forage is supplemented with protein concentrate. Creep feeding is used to increase the weight of the calves on some farms and ranches.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for each soil, the range site and the total annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants.

The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Most of the rangeland in Gregory County is in Clayey, Sandy, Shallow Clay, and Silty range sites. The rest is in Clayey Overflow, Claypan, Closed Depression, Overflow, Saline Lowland, Sands, Shallow, Shallow to Gravel, Subirrigated, Thin Claypan, and Thin Upland range sites. Further information about these range sites is contained in the Technical Guide, which is available in the local office of the Soil Conservation Service.

Potential annual production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The native vegetation in many parts of the county has been greatly depleted by continued excessive use. About 35 percent of the rangeland produces less than half of its potential because of overstocking and poor livestock distribution. Much of the rangeland at one time supported mid prairie grasses but now is dominated by blue grama, buffalograss, Kentucky bluegrass, and weeds. If the livestock graze more than half of the plant growth during the growing season, the productivity and vigor of the desirable grasses are reduced. Continued overgrazing allows invading weeds, such as curlycup gumweed and fringed sagewort, to dominate the site.

Range management that maintains or improves the range condition is needed on all rangeland that is grazed. This management includes measures that maintain an adequate plant cover and maintain or improve plant vigor, deferred grazing during periods when the key plants store carbohydrates, and a grazing system in which the pastures are alternately grazed and rested in a planned sequence. Properly located fences, livestock watering facilities, and salting facilities in areas where grazing is desired help to obtain a uniform distribution of grazing. On Durrstein, Kolls, Scott, and other soils that tend to be wet for long periods, deferred grazing helps to prevent surface compaction.

Native Woods and Windbreaks and Environmental Plantings

Kerry R. Stiner, district conservationist, and Sheridan I. Dronen, forester, helped prepare this section.

Native trees and shrubs grow on about 17,800 acres in Gregory County. They generally grow on the breaks along the deeper drainageways and on the flood plains along the Missouri River and Ponca Creek. The soils that support trees are not classified as woodland soils. Nearly all of the wooded areas provide habitat for wildlife and protection for domestic animals.

Scattered individual plants or clumps of green ash, bur oak, juniper, American plum, common chokecherry, western snowberry, and wild rose are common on the Labu and Sansarc soils on north- and east-facing slopes. Skunkbush sumac grows in some areas of Meadin soils. Plains cottonwood, peachleaf willow, American elm, and boxelder commonly grow on the Munjor and Inavale soils on the flood plain along the Missouri River and on the narrow flood plains along the other major drainageways.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field (fig. 9). The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various

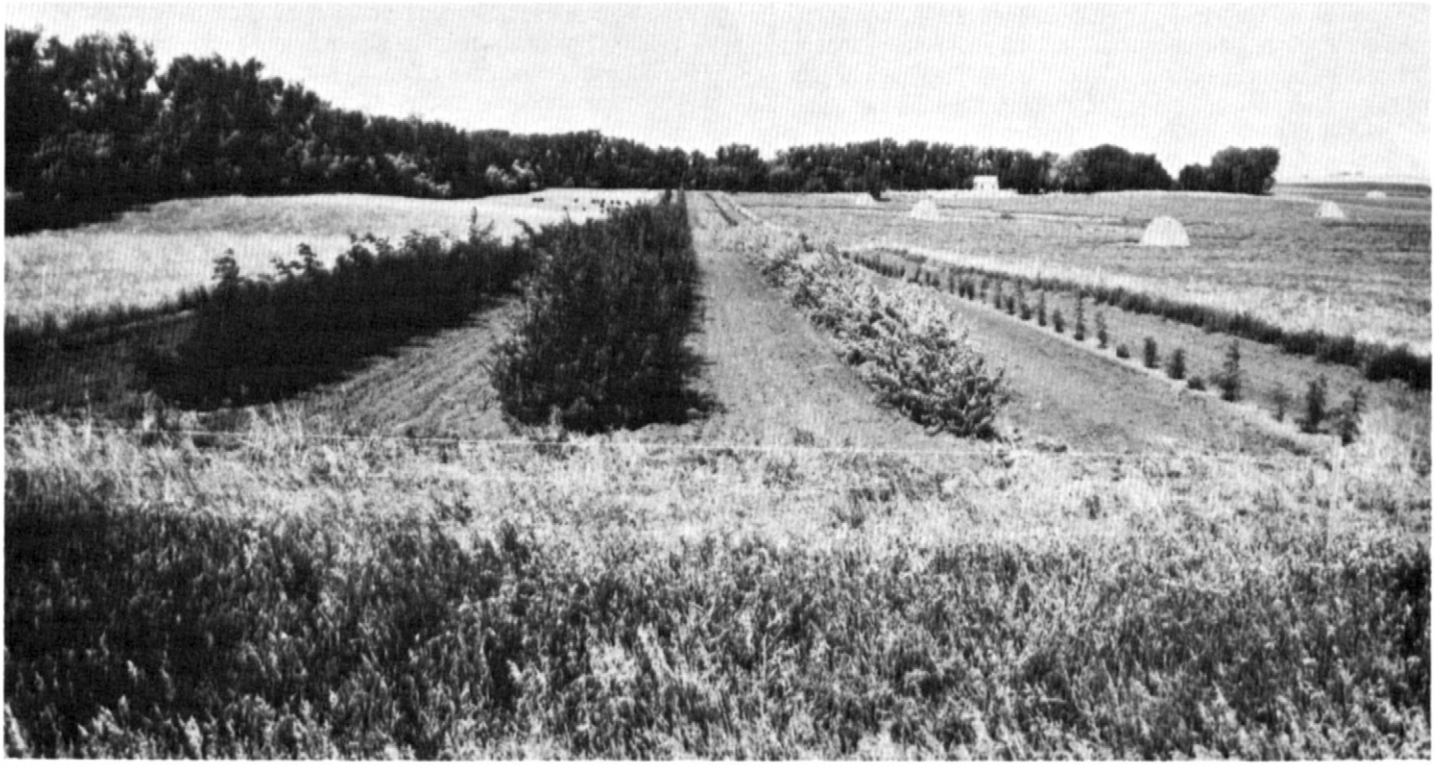


Figure 9.—A well tended windbreak in an area of Reliance silty clay loam, 3 to 6 percent slopes.

soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

Grazing is extremely damaging to windbreaks and environmental plantings because the livestock compact the soil and remove the lower branches of the trees and shrubs. Removal of the lower branches reduces the effectiveness of the windbreaks. Grasses and weeds prevent maximum growth. Clean cultivation and applications of herbicide help to control weeds. Fallowing a year before planting helps to provide a reserve supply of moisture, which is needed before seedlings can be established. On Anselmo, Holt, and other soils that are susceptible to wind erosion, the site should be prepared in the spring so that it is not exposed to wind erosion during the winter.

The effectiveness of many of the older windbreaks in the county can be improved by planting ponderosa pine, eastern redcedar, or Rocky Mountain juniper between the existing rows. Also, additional trees can be planted on the edges of the existing belts.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that

limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Gregory County is unique because it supports the highest population of prairie chickens in South Dakota. It also has a high population of bobwhite and wild turkeys.

The habitat elements needed by a specific species of wildlife generally require several kinds of soil and a combination of land uses. For this reason, interpretations of the soils in the county can best be related to the soil associations described in the section "General Soil Map Units." In the following paragraphs the associations in Gregory County are grouped into five wildlife areas on the basis of their potential for supporting various kinds and amounts of wildlife.

Wildlife area 1 makes up about 31 percent of the acreage in the county. It consists of the Agar, Jansen, Ree, and Reliance associations. The soils are loamy and silty and are nearly level to strongly sloping. The amount of cropland ranges from about 60 percent in the Ree association to about 90 percent in the Agar association. Alfalfa, corn, grain sorghum, and small grain are the main crops. Scattered acreages of native grass are throughout this area. Winter cover is provided mainly by field windbreaks and windbreaks planted around farmsteads and feedlots. The native trees and shrubs along Ponca Creek and its tributaries provide additional winter cover.

The main kinds of openland wildlife that inhabit this area are bobwhite, cottontail, mourning dove, and ring-necked pheasant. A minor population of gray partridge, prairie chicken, and sharp-tailed grouse also inhabits the area. Predators, such as red fox, badger, and coyote, are common throughout the area. Because of the proximity of this area to Wildlife area 3, deer and turkeys also are common.

Wildlife area 2 makes up about 10 percent of the acreage in the county. It is the Anselmo-Holt-Tassel association. The soils are loamy and are nearly level to steep. About 85 percent of the acreage is range. A few scattered areas of Anselmo and Holt soils are cultivated. Alfalfa, corn, and small grain are the main crops.

The range and the naturally occurring woody draws provide a favorable habitat for sharp-tailed grouse, deer, and turkeys. Ring-necked pheasants are plentiful in cultivated areas. Stock water impoundments in some areas provide bass and bluegill fisheries and enhance waterfowl production. Furbearers, mainly muskrat, are along the drainageways and in the impoundments.

Wildlife area 3 makes up about 43 percent of the acreage in the county. It consists of the Meadin-Jansen, Labu-Sansarc, and Okaton-Mariaville associations. Most of this area is on the breaks along Lake Francis Case. The buttes in the northern part of the county also are included in this area. The soils are clayey and loamy and are gently sloping to very steep. Nearly all of the acreage is range.

The wooded draws and the range provide excellent habitat for bobwhite, deer, sharp-tailed grouse, and wild turkeys (fig. 10). A large population of coyotes inhabits this area. Stock water impoundments, mainly in areas of the Labu-Sansarc association, provide bass and bluegill fisheries and enhance waterfowl production. Lake

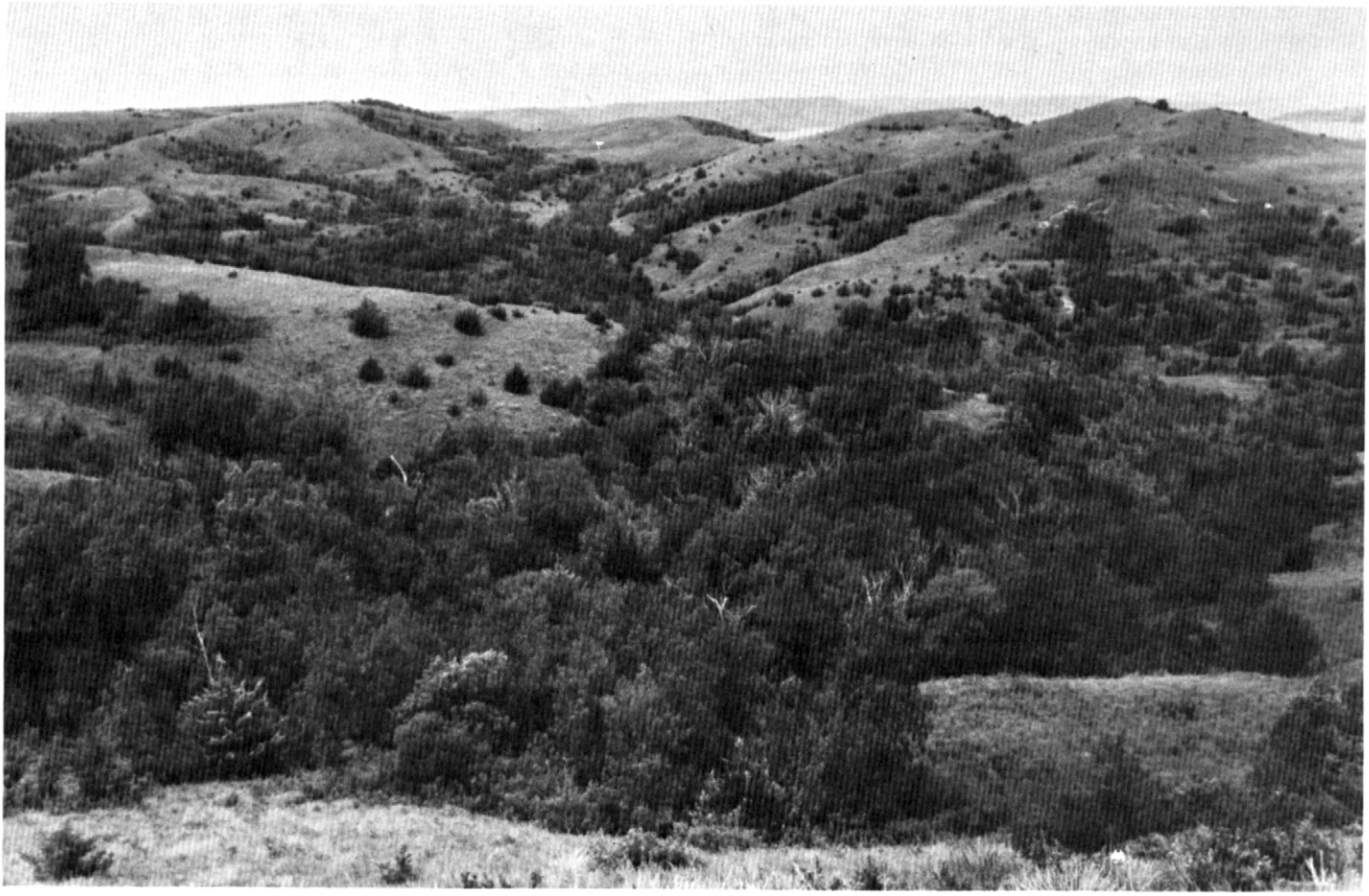


Figure 10.—Native trees and shrubs growing in the draws in an area of Labu-Sansarc clays, 15 to 50 percent slopes. The trees and shrubs provide excellent food and cover for wildlife.

Francis Case, along the eastern border of the county, provides excellent opportunities for fishing and recreation. Migrating Canada geese and ducks use the lake as a resting area and feed on the adjacent cropland. Most of the waterfowl remain until the lake freezes over completely.

Wildlife area 4 makes up about 15 percent of the acreage in the county. It consists of the Promise, Millboro-Boro, and Labu-Promise associations. The soils are clayey and are nearly level to strongly sloping. The amount of cropland ranges from about 30 percent in the Labu-Promise association to about 70 percent in the Promise association. Alfalfa, small grain, and grain sorghum are the main crops. Some corn also is grown.

Native trees and shrubs grow on a very small acreage in this area. Most of the trees and shrubs are grown as windbreaks near farmsteads. The cropland throughout the area is interspersed with range. The area provides a favorable habitat for prairie chicken, pheasant, mourning dove, and gray partridge. A few deer inhabit the parts of the area near Wildlife area 3. Small stock water impoundments throughout the area provide habitat for waterfowl and furbearers. Some of the larger dams provide bass and bluegill fisheries.

Wildlife area 5 makes up about 1 percent of the county. It is the Wendte-Haynie Variant association, which is in areas on the flood plain along the Missouri River below Fort Randall Dam. The soils are clayey and loamy and are nearly level. About 60 percent of the acreage is range. Alfalfa, corn, and small grain are the main crops.

The plum thickets interspersed throughout the areas of cropland provide excellent habitat for bobwhite and pheasant. In many areas cottonwood trees provide roosting sites for bald eagles, which feed on the fish that have been killed when passing through the turbines of Fort Randall Dam. The Fort Randall Bald Eagle Refuge is in this wildlife area. This refuge has one of America's largest wintering concentrations of bald and golden eagles. Deer and cottontail also inhabit this area in large numbers. The Missouri River, on the east side of the

area, provides excellent opportunities for fishing. Walleye pike, sauger, and paddlefish are some of the species that inhabit the river.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons (aerobic) are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 5 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or

soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

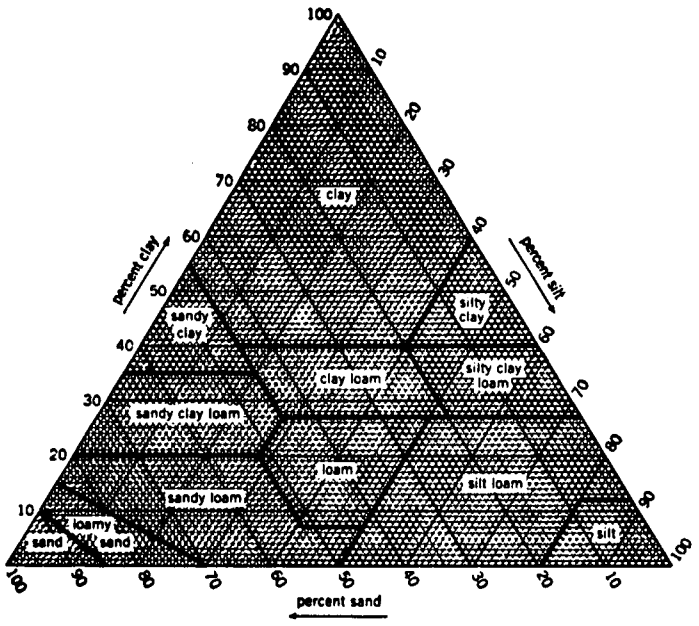


Figure 11.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in

group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in this county range from 0.10 to 0.55. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 16, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months;

November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the South Dakota Department of Transportation, Division of Highways.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning intermittent dryness, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-loamy, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*7*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*9*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Agar Series

The Agar series consists of deep, well drained soils formed in loess on uplands. Permeability is moderate. Slopes range from 0 to 6 percent.

Agar soils are similar to Uly soils and commonly are near Coly, Onita, and Scott soils. Coly soils do not have a mollic epipedon. They are on ridges. Onita soils have a mollic epipedon that is more than 20 inches thick. They are in swales. The poorly drained Scott soils are in depressions. Uly soils do not have an argillic horizon.

Typical pedon of Agar silt loam, 3 to 6 percent slopes, 1,980 feet north and 300 feet west of the southeast corner of sec. 24, T. 95 N., R. 67 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; neutral; clear smooth boundary.

Bt1—7 to 11 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; weak fine prismatic structure parting to moderate medium subangular blocky; shiny surfaces on peds; slightly hard, friable; few fine roots; neutral; clear wavy boundary.

Bt2—11 to 19 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; shiny surfaces on peds; slightly hard, friable; mildly alkaline; clear smooth boundary.

BCk—19 to 30 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; weak fine prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—30 to 40 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; soft, friable; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The depth to free carbonates ranges from 14 to 26 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It has few to many accumulations of carbonate.

Anselmo Series

The Anselmo series consists of deep, well drained soils formed in loamy material on uplands. Permeability is moderately rapid. Slopes range from 2 to 25 percent.

Anselmo soils are similar to Holt and Vetal soils and commonly are near Cass, Dunday, Holt, Tassel, and Vetal soils. The stratified Cass soils are on narrow flood plains. Dunday and Holt soils are in positions on the landscape similar to those of the Anselmo soils. Dunday soils contain more sand and less clay throughout than the Anselmo soils. Holt soils have an argillic horizon. Tassel soils are 6 to 20 inches deep over sandstone. They are higher on the landscape than the Anselmo soils. Vetal soils have a mollic epipedon that is more than 20 inches thick. They are in swales.

Typical pedon of Anselmo fine sandy loam, in an area of Anselmo-Holt fine sandy loams, 6 to 9 percent slopes, 2,245 feet south and 285 feet west of the northeast corner of sec. 34, T. 97 N., R. 72 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; slightly hard, very friable; many fine roots; slightly acid; abrupt smooth boundary.

Bw—8 to 23 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable; many fine roots; slightly acid; gradual wavy boundary.

C1—23 to 31 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; common fine roots; neutral; gradual wavy boundary.

C2—31 to 48 inches; light gray (10YR 7/2) fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; few fine roots; neutral; clear wavy boundary.

Cr—48 to 60 inches; white (2.5Y 8/2) soft sandstone, light gray (2.5Y 7/2) and light yellowish brown (2.5Y 6/4) moist; slight effervescence; mildly alkaline.

The solum ranges from 14 to 38 inches in thickness. It is slightly acid to mildly alkaline. The depth to free carbonates ranges from 30 to 60 inches or more. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to sandstone ranges from 40 to 60 inches or more.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 7 to 18 inches thick. It dominantly is fine sandy loam, but in some pedons it is loam or sandy loam. The Bw horizon has value of 4 to 6 (3 or 4 moist) and chroma of 2 to 4. It is fine sandy loam or loam. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is fine sandy loam, loamy fine sand, or fine sand.

Betts Series

The Betts series consists of deep, well drained soils formed in calcareous, loamy material on uplands. Permeability is moderate in the upper part of the soils

and moderately slow in the underlying material. Slopes range from 15 to 40 percent.

Betts soils commonly are near Coly and Okaton soils. Coly soils contain more silt and less sand throughout than the Betts soils. They are in positions on the landscape similar to those of the Betts soils. Okaton soils formed in clay weathered from shale. They are higher on the landscape than the Betts soils.

Typical pedon of Betts loam, 15 to 40 percent slopes, 1,330 feet south and 730 feet west of the northeast corner of sec. 8, T. 97 N., R. 68 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

AC—5 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, very friable, sticky and plastic; many fine roots; few pebbles in the lower 3 inches; violent effervescence; moderately alkaline; gradual wavy boundary.

Ck—18 to 33 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; common medium accumulations of carbonate; few rounded glacial stones as much as 10 inches in diameter; violent effervescence; moderately alkaline; gradual wavy boundary.

C—33 to 60 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable; few fine accumulations of carbonate; violent effervescence; moderately alkaline.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 2 to 5 inches thick. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4.

Bon Series

The Bon series consists of deep, well drained and moderately well drained soils formed in loamy and silty alluvium on flood plains. Permeability is moderate. Slopes range from 0 to 2 percent.

Bon soils commonly are near Cass, Platte, Ree, and Reliance soils. Cass and Platte soils are in positions on the landscape similar to those of the Bon soils. Cass soils contain more sand and less clay throughout than the Bon soils. The poorly drained Platte soils are 10 to 20 inches deep over gravelly material. Ree and Reliance soils are not stratified and are dark to a depth of less than 20 inches. They are on uplands.

Typical pedon of Bon silt loam, channeled, 1,680 feet north and 100 feet west of the southeast corner of sec. 6, T. 96 N., R. 72 W.

A1—0 to 8 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate fine granular; slightly hard, very friable; many fine roots; neutral; clear wavy boundary.

A2—8 to 27 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; common fine roots; mildly alkaline; clear wavy boundary.

C—27 to 32 inches; grayish brown (10YR 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to moderate medium and fine granular; slightly hard, very friable; few roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Ab—32 to 43 inches; dark gray (10YR 4/1) silt loam stratified with thin layers of loamy fine sand and silty clay loam; black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium and fine granular; slightly hard, very friable; few roots; few fine accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

C'—43 to 60 inches; grayish brown (10YR 5/2) silt loam stratified with thin layers of loamy fine sand and silty clay loam; very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; few roots; many fine accumulations of carbonate; slight effervescence; moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is silt loam but in some pedons is loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 (2 to 4 moist), chroma of 1 or 2. It is mildly alkaline or moderately alkaline. Some pedons do not have a buried A horizon.

Boro Series

The Boro series consists of deep, well drained soils formed in clayey material on uplands. Permeability is slow. Slopes range from 2 to 15 percent.

Boro soils are similar to Labu, Lakoma, and Millboro soils and commonly are near Labu, Lakoma, Millboro, Okaton, and Reliance soils. Labu and Lakoma soils are underlain by shale at a depth of 20 to 40 inches. Millboro and Reliance soils have a mollic epipedon. They are in positions on the landscape similar to those of the Boro soils. Okaton soils are underlain by shale at a depth of 8

to 20 inches. They are higher on the landscape than the Boro soils.

Typical pedon of Boro silty clay, in an area of Boro-Millboro silty clays, 2 to 6 percent slopes, 2,110 feet north and 2,240 feet west of the southeast corner of sec. 1, T. 99 N., R. 72 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; strong effervescence; mildly alkaline; clear smooth boundary.

Bw—5 to 17 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk—17 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak fine blocky; very hard, firm, sticky and plastic; common medium and fine accumulations of carbonate; violent effervescence; mildly alkaline; gradual wavy boundary.

BCk—24 to 31 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; common medium and fine accumulations of carbonate; violent effervescence; mildly alkaline; gradual wavy boundary.

C—31 to 47 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few pebbles in the lower 5 inches; few fine accumulations of carbonate; violent effervescence; mildly alkaline; gradual wavy boundary.

Cy—47 to 60 inches; pale yellow (2.5Y 7/4) silty clay, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; many gypsum crystals; violent effervescence; mildly alkaline.

In some pedons free carbonates are leached to a depth of 2 or 3 inches. The thickness of the solum ranges from 24 to 37 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It dominantly is silty clay but in some pedons is clay. The Bw and C horizons also are silty clay or clay. The Bw horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. In some pedons shale is at a depth of 40 to 60 inches.

Brocksburg Series

The Brocksburg series consists of well drained soils that are moderately deep over gravelly sand. These soils formed in alluvial sediment in shallow swales on uplands. Permeability is moderate in the subsoil and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Brocksburg soils commonly are near Jansen, Meadin, Onita, and Ree soils. Jansen and Ree soils have a mollic epipedon that is less than 20 inches thick. They are slightly higher on the landscape than the Brocksburg soils. Meadin soils are less than 20 inches deep over gravelly sand. They are steeper than the Brocksburg soils. Onita soils contain more clay in the subsoil than the Brocksburg soils and do not have gravelly material within a depth of 40 inches. They are in positions on the landscape similar to those of the Brocksburg soils.

Typical pedon of Brocksburg loam, in an area of Jansen-Brocksburg loams, 0 to 2 percent slopes, 525 feet east and 175 feet north of the southwest corner of sec. 10, T. 96 N., R. 71 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; few fine roots; slightly acid; abrupt smooth boundary.

A—6 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable; few fine roots; neutral; clear wavy boundary.

Bt1—15 to 26 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine prismatic structure parting to moderate fine subangular blocky; slightly hard, friable; shiny surfaces on peds; neutral; gradual wavy boundary.

Bt2—26 to 36 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; mildly alkaline; abrupt wavy boundary.

2C—36 to 60 inches; multicolored gravelly sand; single grain; loose; mildly alkaline.

The thickness of the solum, or the depth to sandy or gravelly material, ranges from 26 to 36 inches. The thickness of the mollic epipedon ranges from 20 to 30 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is loam but in some pedons is silt loam or sandy loam. It is slightly acid or neutral. The Bt horizon is loam or clay loam. The 2C horizon is coarse sand, gravelly sand, or sand.

Carter Series

The Carter series consists of deep, moderately well drained soils formed in clayey material weathered from shale on uplands. Permeability is very slow. Slopes range from 0 to 3 percent.

Carter soils are similar to Mosher soils and commonly are near Hurley, Kolls, Millboro, Promise, and Witten soils. Hurley and Mosher soils have a natric horizon. The poorly drained Kolls soils are in depressions. Millboro, Promise, and Witten soils are not characterized by an abrupt textural change between the surface layer and the subsoil. Millboro and Promise soils are higher on the landscape than the Carter soils. Hurley, Mosher, and Witten soils are in positions on the landscape similar to those of the Carter soils.

Typical pedon of Carter silty clay loam, in an area of Carter-Hurley complex, 0 to 3 percent slopes, 1,350 feet east and 150 feet south of the northwest corner of sec. 20, T. 100 N., R. 73 W.

A—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many fine roots; mildly alkaline; abrupt wavy boundary.

Bt1—6 to 9 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; common fine roots; mildly alkaline; abrupt wavy boundary.

Bt2—9 to 16 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; common fine roots; moderately alkaline; clear wavy boundary.

BC—16 to 23 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium blocky structure parting to moderate fine blocky; extremely hard, very firm, very sticky and very plastic; common fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Ck—23 to 34 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky and very plastic; few fine roots along vertical faces of peds; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ckz—34 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, very sticky and very plastic; many fine accumulations of carbonate and salts; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 26 inches. The depth to free carbonates ranges from 10 to 23 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is silty clay loam but in some pedons is silt loam. It ranges from slightly acid to mildly alkaline. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 2. It ranges from neutral to moderately alkaline. The content of clay in this horizon ranges from 60 to 70 percent. The C horizon has hue of 5Y or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is clay or silty clay. It has few to many accumulations of carbonate and salt crystals and is mildly alkaline or moderately alkaline. The content of exchangeable sodium in the B and C horizons ranges from 5 to 15 percent.

Cass Series

The Cass series consists of deep, well drained soils formed in loamy alluvium on flood plains. Permeability is moderately rapid. Slopes range from 0 to 2 percent.

Cass soils commonly are near Anselmo, Bon, Fedora, Inavale, and Valentine soils. Anselmo and Valentine soils are not stratified. They are higher on the landscape than the Cass soils. Bon, Fedora, and Inavale soils are in positions on the landscape similar to those of the Cass soils. Bon soils contain more clay and less sand throughout than the Cass soils. Fedora soils are poorly drained. Inavale soils are somewhat excessively drained.

Typical pedon of Cass fine sandy loam, channeled, 2,590 feet south and 240 feet east of the northwest corner of sec. 18, T. 97 N., R. 71 W.

A—0 to 19 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak coarse granular structure; slightly hard, very friable; many fine roots; neutral; gradual wavy boundary.

AC—19 to 34 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; slightly hard, very friable; few fine roots; neutral; clear wavy boundary.

C1—34 to 40 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C2—40 to 48 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C3—48 to 60 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; common fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to free carbonates ranges from 25 to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is fine sandy loam but in some pedons is silt loam, loam, or very fine sandy loam. It ranges from medium acid to neutral. Some pedons do not have an AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is fine sandy loam, sandy loam, or loamy fine sand. It ranges from slightly acid to mildly alkaline.

Coly Series

The Coly series consists of deep, well drained soils formed in loess on uplands. Permeability is moderate. Slopes range from 6 to 25 percent.

Coly soils commonly are near Betts, Sansarc, and Uly soils. Betts soils contain more sand and less silt throughout than the Coly soils. They are in positions on the landscape similar to those of the Coly soils. Sansarc soils formed in clay weathered from shale. They generally are lower on the landscape than the Coly soils. Uly soils have a mollic epipedon. They are on the less sloping parts of the landscape.

Typical pedon of Coly silt loam, 6 to 9 percent slopes, 1,520 feet west and 1,400 feet north of the southeast corner of sec. 24, T. 95 N., R. 67 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and very fine granular structure; soft, very friable, slightly sticky; few fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

ACk—5 to 13 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky; few roots in the upper part; common medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

Ck—13 to 29 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; common medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C—29 to 60 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; massive; soft, very friable; few fine accumulations of carbonate; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 7 to 14 inches. Typically, free carbonates are at the surface, but in some pedons they are leached to a depth of 8 inches.

The A horizon has value of 4 to 6 (3 or 4 moist) and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4.

Dunday Series

The Dunday series consists of deep, somewhat excessively drained soils formed in sandy material on uplands. Permeability is rapid. Slopes range from 0 to 9 percent.

Dunday soils commonly are near Anselmo, Valentine, Vetal, and Whitelake soils. Anselmo soils contain more clay throughout than the Dunday soils. They are in positions on the landscape similar to those of the Dunday soils. Valentine soils do not have a mollic epipedon. They are higher on the landscape than the Dunday soils. Vetal and Whitelake soils are lower on the landscape than the Dunday soils. Vetal soils have a mollic epipedon that is more than 20 inches thick. Whitelake soils have a natric horizon.

Typical pedon of Dunday loamy fine sand, in an area of Anselmo-Dunday complex, 3 to 9 percent slopes, 120 feet south and 2,240 feet east of the northwest corner of sec. 28, T. 97 N., R. 72 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; soft, very friable; many fine roots; neutral; clear wavy boundary.

A2—6 to 10 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky and weak fine granular; soft, very friable; few thin layers of fine sand; many fine roots; slightly acid; clear wavy boundary.

AC—10 to 17 inches; dark brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable; few thin layers of fine sand; common fine roots; neutral; gradual wavy boundary.

C1—17 to 25 inches; yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable; few fine roots; neutral; gradual wavy boundary.

C2—25 to 60 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 14 to 30 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. In some pedons free carbonates are below a depth of 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is loamy sand, fine sand, or loamy fine sand.

Durrstein Series

The Durrstein series consists of deep, poorly drained soils formed in alluvium on flood plains. Permeability is slow. Slopes are less than 1 percent.

Durrstein soils are similar to Hurley and Jerauld soils and commonly are near Bon, Mosher, and Ree soils. Bon and Ree soils do not have a natric horizon. Hurley, Jerauld, and Mosher soils are moderately well drained. Bon and Mosher soils are in positions on the landscape similar to those of the Durrstein soils. Ree soils are on uplands.

Typical pedon of Durrstein silt loam, 2,580 feet west and 200 feet north of the southeast corner of sec. 18, T. 96 N., R. 73 W.

E—0 to 1 inch; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; neutral; abrupt wavy boundary.

Bt1—1 to 4 inches; dark gray (10YR 4/1) clay, very dark brown (10YR 2/2) moist; moderate fine columnar structure parting to moderate fine blocky; very hard, firm, slightly sticky and plastic; thin gray (10YR 6/1) coatings on the top of columns; moderately alkaline; clear wavy boundary.

Bt2—4 to 12 inches; dark gray (10YR 4/1) clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; shiny surfaces on peds; slight effervescence; moderately alkaline; clear wavy boundary.

BCzk—12 to 18 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to weak fine granular; hard, firm, slightly sticky and slightly plastic; few fine accumulations of salts; slight effervescence; strongly alkaline; clear wavy boundary.

Cz—18 to 27 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; common fine accumulations of salts; violent effervescence; strongly alkaline; clear wavy boundary.

Czg1—27 to 44 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; weak coarse prismatic structure; very hard, friable, sticky and slightly plastic; many fine accumulations of salts; violent effervescence; strongly alkaline; gradual wavy boundary.

Czg2—44 to 60 inches; gray (5Y 6/1) silt loam, gray (5Y 5/1) moist; few fine prominent strong brown (7.5YR 5/6) mottles; massive; hard, friable, slightly sticky; many fine accumulations of salts; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 12 to 28 inches. The depth to visible salts ranges from 10 to 15 inches.

The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It dominantly is silt loam but in some pedons is loam. It is slightly acid or neutral and is 1 to 4 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay, clay loam, or silty clay. It ranges from neutral to strongly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It is clay loam, silt loam, silty clay loam, or silty clay. In some pedons sandy material is at a depth of 40 to 60 inches.

Fedora Series

The Fedora series consists of deep, poorly drained soils formed in sandy and loamy alluvium on flood plains. Permeability is moderately rapid in the upper part of the soils and rapid in the underlying material. Slopes range from 0 to 2 percent.

Fedora soils commonly are near Anselmo, Bon, Cass, Vetal, and Whitelake soils. The well drained Anselmo and Vetal soils are higher on the landscape than the Fedora soils. Bon, Cass, and Whitelake soils are in positions on the landscape similar to those of the Fedora soils. The moderately well drained Bon soils contain more clay and less sand throughout than the Fedora soils. The well drained Cass soils do not have free carbonates within a depth of 25 inches. Whitelake soils have a natric horizon.

Typical pedon of Fedora loam, 2,320 feet south and 69 feet west of the northeast corner of sec. 28, T. 97 N., R. 72 W.

A—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable; many fine roots; strong effervescence; mildly alkaline; gradual wavy boundary.

ACk1—8 to 19 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to moderate fine granular; soft, very friable; common roots; violent effervescence; moderately alkaline; abrupt wavy boundary.

ACk2—19 to 32 inches; light brownish gray (10YR 6/2) fine sandy loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable; common roots; many disseminated carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

C1—32 to 42 inches; gray (10YR 6/1) loam, grayish brown (10YR 5/2) moist; few fine distinct light olive brown (2.5Y 5/6) mottles; massive; very hard, very friable; few roots; neutral; gradual wavy boundary.

C2—42 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; few fine faint light olive brown (2.5Y 5/6) mottles; massive; slightly hard, very friable; neutral.

The A horizon has hue of 10YR or 2.5Y, value of 4 (2 or 3 moist), and chroma of 1 or 2. It dominantly is loam but in some pedons is sandy loam or fine sandy loam. It is 6 to 15 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (5 or 6 moist), and chroma of 1 or 2. It is loam, sandy loam, loamy sand, or loamy fine sand.

Haynie Variant

The Haynie Variant consists of deep, well drained soils formed in alluvium on the flood plain along the Missouri River. Permeability is moderate. Slopes range from 0 to 2 percent.

Haynie Variant soils are similar to Munjor soils and commonly are near Munjor and Wendte soils. Munjor soils are slightly higher and Wendte soils slightly lower on the landscape than the Haynie Variant soils. Also, Munjor soils contain more fine sand within a depth of 40 inches, and Wendte soils contain more clay throughout.

Typical pedon of Haynie Variant very fine sandy loam, in an area of Haynie Variant-Munjor complex, 795 feet east and 1,460 feet north of the southwest corner of sec. 16, T. 95 N., R. 65 W.

A—0 to 7 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C1—7 to 21 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C2—21 to 25 inches; light gray (2.5Y 7/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; common fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C3—25 to 34 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; common fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C4—34 to 60 inches; light brownish gray (2.5Y 6/2) loamy very fine sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; few roots to a depth of 41 inches; slight effervescence; mildly alkaline.

The solum, or the A horizon, is less than 10 inches thick. It has hue of 2.5Y or 10YR. It dominantly is very fine sandy loam but in some pedons is silt loam. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (4 or 5 moist), and chroma of 2 to 4. In some pedons it has thin strata of fine sandy loam, fine sand, very fine sand, or loamy fine sand.

Holt Series

The Holt series consists of moderately deep, well drained soils formed in soft sandstone residuum on uplands. Permeability is moderate. Slopes range from 0 to 15 percent.

Holt soils are similar to Anselmo soils and commonly are near Anselmo, Ree, Tassel, and Vetal soils. Anselmo soils do not have an argillic horizon. Ree soils contain more clay in the subsoil than the Holt soils. They are in positions on the landscape similar to those of the Holt soils. Tassel soils have sandstone within a depth of 20 inches. They generally are higher on the landscape than the Holt soils. Vetal soils have a mollic epipedon that is more than 20 inches thick. They are in swales.

Typical pedon of Holt fine sandy loam, in an area of Anselmo-Holt fine sandy loams, 6 to 9 percent slopes, 2,390 feet north and 315 feet west of the southeast corner of sec. 36, T. 97 N., R. 72 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structrure; slightly hard, friable; many fine roots; neutral; clear smooth boundary.

Bt1—5 to 11 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; many fine roots; neutral; clear smooth boundary.

Bt2—11 to 17 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; common fine roots; neutral; clear smooth boundary.

BC—17 to 23 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; common fine roots; mildly alkaline; clear smooth boundary.

C—23 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; hard, friable; few fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual smooth boundary.

Cr—30 to 60 inches; white (2.5Y 8/2) soft sandstone, light brownish gray (2.5Y 6/2) moist; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 30 inches. The depth to sandstone ranges from 22 to 36 inches. The depth to free carbonates ranges from 18 to

30 inches. The thickness of the mollic epipedon ranges from 7 to 12 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 5 to 10 inches thick. It is neutral or mildly alkaline. The Bt horizon also is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. The Cr horizon is weakly cemented to strongly cemented sandstone.

Hurley Series

The Hurley series consists of deep, moderately well drained soils formed in clayey material on uplands. Permeability is very slow. Slopes range from 0 to 3 percent.

These soils are deeper over shale than is defined as the range for the Hurley series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Hurley soils are similar to Durrstein and Jerauld soils and commonly are near Carter, Kolls, Millboro, Promise, and Witten soils. The nearby soils do not have a natric horizon. Carter and Witten soils are in positions on the landscape similar to those of the Hurley soils. Kolls soils are in depressions. Millboro and Promise soils are higher on the landscape than the Hurley soils. Durrstein and Jerauld soils contain more sand and less clay throughout than the Hurley soils.

Typical pedon of Hurley silt loam, in an area of Carter-Hurley complex, 0 to 3 percent slopes, 1,540 feet east and 220 feet south of the northwest corner of sec. 20, T. 100 N., R. 73 W.

E—0 to 4 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; slightly hard, firm; many fine roots; neutral; abrupt wavy boundary.

Bt1—4 to 8 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to moderate fine and medium blocky; extremely hard, extremely firm, very sticky and very plastic; common fine roots; mildly alkaline; clear wavy boundary.

Bt2—8 to 12 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; common fine roots; mildly alkaline; clear wavy boundary.

BCz—12 to 19 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium and coarse blocky structure parting to moderate medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; few fine and medium accumulations of salts; common fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

Ckz—19 to 33 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure; very hard, very firm, very sticky and very plastic; many fine accumulations of salts; common medium accumulations of carbonate; common fine accumulations of gypsum; few fine roots; violent effervescence; moderately alkaline; gradual wavy boundary.

Cy—33 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; many medium accumulations of gypsum crystals; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 9 to 20 inches. The depth to visible salt crystals ranges from 5 to 16 inches. The depth to shale ranges from 36 to more than 60 inches.

The E horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It dominantly is silt loam but in some pedons is silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. The content of clay in this horizon ranges from 60 to 70 percent. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2.

Inavale Series

The Inavale series consists of deep, somewhat excessively drained soils formed in sandy alluvium on flood plains. Permeability is rapid. Slopes range from 0 to 3 percent.

These soils have a darker surface layer and contain more gravel in the underlying material than is defined as the range for the Inavale series. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Inavale soils commonly are near Cass and Platte soils. The well drained Cass and poorly drained Platte soils are in positions on the landscape similar to those of the Inavale soils.

Typical pedon of Inavale loamy sand, 1,330 feet north and 1,980 feet east of the southwest corner of sec. 22, T. 95 N., R. 65 W.

A—0 to 11 inches; dark grayish brown (10YR 4/2) loamy sand, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; many fine roots; neutral; clear wavy boundary.

AC—11 to 17 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to single grain; soft, very friable; common fine roots; neutral; gradual wavy boundary.

C—17 to 60 inches; pale brown (10YR 6/3) stratified fine sand and coarse sand, brown (10YR 5/3) moist; single grain; loose; few fine roots in the upper 8 inches; about 10 percent gravel; mildly alkaline.

The thickness of the solum ranges from 10 to 25 inches. The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 to 3. It dominantly is loamy sand but in some pedons is fine sand. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It is loamy fine sand, fine sand, very fine sand, or coarse sand. In most pedons the content of gravel in this horizon is as much as 15 percent.

Jansen Series

The Jansen series consists of well drained soils that are moderately deep over coarse sand. These soils formed in loamy alluvial sediments on uplands. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 9 percent.

Jansen soils are similar to Ree soils and commonly are near Brocksburg, Meadin, O'Neill, Onita, and Ree soils. Brocksburg and Onita soils have a mollic epipedon that extends below a depth of 20 inches. They are lower on the landscape than the Jansen soils. Meadin soils are less than 20 inches deep over gravelly sand. They generally are steeper than the Jansen soils. O'Neill and Ree soils are in positions on the landscape similar to those of the Jansen soils. O'Neill soils contain less clay in the subsoil than the Jansen soils. Ree soils are more than 40 inches deep over gravelly sand.

Typical pedon of Jansen loam, 3 to 6 percent slopes, 140 feet east and 1,820 feet north of the southwest corner of sec. 4, T. 96 N., R. 71 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard; very friable; common fine roots; neutral; abrupt smooth boundary.

A—7 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to moderate medium and fine granular; hard, very friable; common fine roots; neutral; clear wavy boundary.

Bt1—12 to 19 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common roots; shiny very dark grayish brown (10YR 3/2) surfaces on peds; neutral; gradual wavy boundary.

Bt2—19 to 28 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common roots; shiny very dark grayish brown (10YR 3/2) surfaces on peds; neutral; clear wavy boundary.

BC—28 to 31 inches; pale brown (10YR 6/3) sandy clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

2C—31 to 60 inches; multicolored coarse sand; about 5 percent gravel; loose; neutral.

The thickness of the solum, or the depth to gravelly material, ranges from 20 to 36 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is loam, but in some pedons it is silt loam or sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is clay loam, loam, or sandy clay loam. The 2C horizon is coarse sand, gravelly sand, or sand.

Jerauld Series

The Jerauld series consists of deep, moderately well drained soils formed in alluvium on terraces and uplands. Permeability is very slow. Slopes range from 0 to 3 percent.

Jerauld soils are similar to Durrstein and Hurley soils and commonly are near Mosher, Onita, and Reliance soils. Durrstein soils are poorly drained. Hurley soils contain more clay and less sand throughout than the Jerauld soils. Onita and Reliance soils do not have a natric horizon. Onita soils are in upland swales. Reliance soils are on uplands.

Typical pedon of Jerauld silt loam, in an area of Mosher-Jerauld silt loams, 370 feet east and 335 feet north of the southwest corner of sec. 16, T. 97 N., R. 73 W.

E—0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; many roots; slightly acid; abrupt irregular boundary.

Bt—3 to 9 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to strong medium and fine subangular blocky; very hard, firm, sticky and plastic; thin grayish brown (10YR 5/2) coatings on the tops and upper sides of columns; many roots; moderately alkaline; clear wavy boundary.

BCyz—9 to 19 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common roots; many fine accumulations

of gypsum and salts; slight effervescence; moderately alkaline; gradual wavy boundary.

Cyz1—19 to 25 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few roots; few fine accumulations of gypsum and salts; few medium accumulations of carbonate; violent effervescence; strongly alkaline; gradual wavy boundary.

Cyz2—25 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; few roots; few fine accumulations of gypsum and salts; violent effervescence; very strongly alkaline; gradual wavy boundary.

Cyz3—36 to 60 inches; light gray (2.5Y 7/2) clay loam, light yellowish brown (2.5Y 6/4) moist; massive; very hard, friable, sticky and plastic; few fine accumulations of gypsum salts; violent effervescence; strongly alkaline.

The thickness of the solum ranges from 12 to 29 inches. The depth to free carbonates ranges from 8 to 17 inches.

The E horizon has value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It dominantly is silt loam but in some pedons is silty clay loam. Some pedons have an A horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is silty clay or clay. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It generally ranges from silty clay loam to clay. In some pedons, however, it is stratified clay loam, loam, or silty clay loam.

Kolls Series

The Kolls series consists of deep, poorly drained soils formed in clayey local alluvium in depressions on uplands. Permeability is very slow. Slopes are less than 1 percent.

Kolls soils commonly are near Millboro, Promise, and Witten soils. The well drained Millboro and Promise soils are higher on the landscape.than the Kolls soils. The moderately well drained Witten soils are in swales.

Typical pedon of Kolls clay, 1,040 feet south and 50 feet west of the northeast corner of sec. 8, T. 99 N., R. 72 W.

A—0 to 4 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine granular structure; hard, firm, very sticky and very plastic; many fine roots; mildly alkaline; clear wavy boundary.

Bg1—4 to 19 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; many fine roots; slight effervescence; moderately alkaline; gradual wavy boundary.

Bg2—19 to 34 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse blocky structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; evident pressure faces; common fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg1—34 to 44 inches; dark gray (5Y 4/1) clay, very dark gray (5Y 3/1) moist; weak coarse blocky structure; extremely hard, very firm, very sticky and very plastic; evident pressure faces; few roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg2—44 to 60 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; massive; hard, very firm, very sticky and very plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches. The mollic epipedon ranges from 10 to more than 20 inches in thickness.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 0 or 1. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 0 or 1. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 to 3. In some pedons it has accumulations of gypsum crystals.

Labu Series

The Labu series consists of moderately deep, well drained soils formed in clayey residuum on uplands. Permeability is slow. Slopes range from 2 to 30 percent.

Labu soils are similar to Boro, Lakoma, and Promise soils and commonly are near Boro, Lakoma, Millboro, Promise, Reliance, and Sansarc soils. Boro and Millboro soils are more than 40 inches deep over shale. Lakoma soils are more friable than the Labu soils. Millboro, Promise, and Reliance soils have a mollic epipedon. Millboro soils generally are on the lower, less sloping parts of the landscape, and Reliance soils generally are on the higher, less sloping parts. Sansarc soils have shale within a depth of 20 inches. They are on the steeper, more convex parts of the landscape.

Typical pedon of Labu clay, 9 to 15 percent slopes, 2,090 feet north and 245 feet east of the southwest corner of sec. 35, T. 99 N., R. 73 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, firm, sticky and plastic;

slight effervescence; mildly alkaline; abrupt wavy boundary.

Bw1—6 to 13 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, firm, sticky and very plastic; few fine accumulations of carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

Bw2—13 to 21 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, very firm, sticky and very plastic; about 15 percent shale fragments; common fine accumulations of carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

C—21 to 30 inches; light brownish gray (2.5Y 6/2) very shaly clay, grayish brown (2.5Y 5/2) moist; massive; very hard, very firm, sticky and very plastic; about 60 percent shale fragments; few medium accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

Cr1—30 to 36 inches; light brownish gray (2.5Y 6/2) shale, grayish brown (2.5Y 5/2) moist; thin very dark gray (10YR 3/1) seams; mildly alkaline; clear wavy boundary.

Cr2—36 to 60 inches; light brownish gray (2.5Y 6/2) shale, grayish brown (2.5Y 5/2) moist; very hard, very firm; mildly alkaline.

The thickness of the solum ranges from 20 to 28 inches. The depth to shale ranges from 20 to 40 inches. Free carbonates typically are throughout the profile, but in some pedons they are not evident in the surface layer.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It dominantly is clay but in some pedons is silty clay. The Bw and C horizons also are clay or silty clay. The Bw horizon has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The C horizon has hue of 5Y or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The Cr horizon has hue of 5Y to 10YR, value of 6 or 7 (5 or 6 moist), and chroma of 2 to 4.

Lakoma Series

The Lakoma series consists of moderately deep, well drained soils formed in clayey residuum on uplands. Permeability is slow. Slopes range from 2 to 25 percent.

Lakoma soils are similar to Boro, Labu, and Okaton soils and commonly are near Boro, Labu, Millboro, and Okaton soils. Boro soils do not have shale within a depth of 40 inches. Labu soils are more dense than the Lakoma soils. Millboro soils have a mollic epipedon and are more than 40 inches deep over shale. They generally are on the less sloping parts of the landscape. Okaton soils have shale within a depth of 20 inches. They are on the steeper, more convex parts of the landscape.

Typical pedon of Lakoma silty clay, in an area of Lakoma-Okaton silty clays, 9 to 15 percent slopes, 625 feet south and 1,890 feet east of the northwest corner of sec. 7, T. 98 N., R. 73 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; violent effervescence; mildly alkaline; clear wavy boundary.

Bw—6 to 13 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; violent effervescence; mildly alkaline; clear wavy boundary.

BC—13 to 25 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; strong effervescence; mildly alkaline; clear wavy boundary.

C—25 to 29 inches; light yellowish brown (2.5Y 6/4) and pale yellow (2.5Y 7/4) shaly clay, light olive brown (2.5Y 5/4) moist; hard, firm, sticky and plastic; massive; about 40 percent shale fragments; strong effervescence; mildly alkaline; clear wavy boundary.

Cr—29 to 60 inches; pale yellow (2.5Y 7/4) and light gray (2.5Y 7/2) shale, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; many gypsum crystals and accumulations of carbonate along bedding planes; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 16 to 26 inches. The depth to shale ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It dominantly is silty clay but in some pedons is clay. The Bw horizon has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4.

Mariaville Series

The Mariaville series consists of shallow, well drained soils formed in siltstone residuum on uplands. Permeability is moderate above the siltstone. Slopes range from 6 to more than 40 percent.

Mariaville soils are similar to Tassel soils and commonly are near Anselmo, Labu, Meadin, Okaton, and Reliance soils. Anselmo soils are more than 40 inches deep over sandstone. The clayey Labu soils are moderately deep over shale. Meadin soils are underlain

by gravelly sand at a depth of 8 to 20 inches. Okaton soils contain more clay than the Mariaville soils and have shale within a depth of 20 inches. The deep Reliance soils contain more clay in the subsoil than the Mariaville soils. Tassel soils contain more sand than the Mariaville soils. Anselmo, Labu, and Okaton soils are lower on the landscape than the Mariaville soils, and Meadin and Reliance soils are higher.

Typical pedon of Mariaville loam, 15 to 40 percent slopes, 920 feet west and 2,140 feet south of the northeast corner of sec. 15, T. 98 N., R. 70 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

AC—5 to 12 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine roots; violent effervescence; mildly alkaline; clear wavy boundary.

C—12 to 18 inches; light gray (2.5Y 7/2) loam, light brownish gray (2.5Y 6/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine roots; common medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

Cr—18 to 60 inches; white (2.5Y 8/2) soft siltstone, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable; few fine roots along fractures in the upper 25 inches; strong effervescence; moderately alkaline.

The depth to siltstone ranges from 10 to 20 inches. The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 2. It dominantly is loam but in some pedons is silt loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silt loam, loam, or silty clay loam. The Cr horizon has hue of 10YR or 2.5Y, value of 6 to 8 (5 to 7 moist), and chroma of 2 to 4.

Meadin Series

The Meadin series consists of excessively drained soils formed in loamy and sandy alluvium on high terraces. These soils are shallow over gravelly sand. Permeability is rapid. Slopes range from 3 to 25 percent.

Meadin soils commonly are near Brocksburg, Jansen, O'Neill, and Ree soils. The nearby soils are on the less sloping parts of the landscape. Brocksburg, Jansen, and O'Neill soils are underlain by sandy and gravelly material at a depth of 20 to 40 inches. Ree soils are more than 40 inches deep over gravelly material.

Typical pedon of Meadin sandy loam, 9 to 25 percent slopes, 550 feet north and 2,430 feet east of the southwest corner of sec. 35, T. 97 N., R. 72 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, very friable; many roots; slightly acid; clear wavy boundary.

A2—6 to 11 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable; many roots; slightly acid; clear wavy boundary.

AC—11 to 17 inches; dark brown (10Y 4/3) loamy sand, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky and single grain; slightly hard, very friable; many roots; slightly acid; gradual wavy boundary.

2C—17 to 60 inches; multicolored gravelly coarse sand; single grain; loose; about 15 percent gravel; neutral.

The thickness of the solum ranges from 8 to 20 inches and corresponds to the depth to gravelly sand. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is sandy loam but in some pedons is fine sandy loam, loamy fine sand, or loamy sand. In some pedons the C horizon is stratified with finer textured material.

Millboro Series

The Millboro series consists of deep, well drained soils formed in clayey material on uplands. Permeability is slow. Slopes range from 0 to 9 percent.

Millboro soils are similar to Boro, Promise, and Reliance soils and commonly are near Boro, Kolls, Lakoma, Promise, Reliance, and Witten soils. Boro and Lakoma soils do not have a mollic epipedon. They generally are on the more sloping parts of the landscape. The poorly drained Kolls soils are in depressions. Promise soils do not have an argillic horizon and contain more clay throughout than the Millboro soils. Reliance soils contain less clay throughout than the Millboro soils. Witten soils are dark to a depth of more than 20 inches. They are in swales.

Typical pedon of Millboro silty clay, 0 to 2 percent slopes, 480 feet west and 110 feet north of the southeast corner of sec. 28, T. 100 N., R. 73 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay, very dark brown (10YR 2/2) moist; weak medium granular structure; hard, friable, sticky and plastic; neutral; abrupt wavy boundary.

A—6 to 10 inches; dark grayish brown (10YR 4/2) silty clay, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; neutral; clear wavy boundary.
Bt—10 to 28 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine blocky; very hard, firm, very sticky and very plastic; few pressure faces; slight effervescence; mildly alkaline; gradual wavy boundary.
BCk—28 to 36 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure parting to weak medium subangular blocky; very hard, very firm, sticky and plastic; few medium accumulations of carbonate; violent effervescence; mildly alkaline; clear wavy boundary.
C1—36 to 48 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; strong effervescence; moderately alkaline; gradual wavy boundary.
C2—48 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; massive; very hard, very firm, very sticky and very plastic; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 42 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches. Free carbonates are at the surface in some pedons.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is silty clay but in some pedons is silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 to 3. It is clay or silty clay. The clay content in this horizon is as low as 50 percent in some pedons and as high as 60 percent in others. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is clay or silty clay. In some pedons shale is at a depth of 40 to 60 inches.

Mosher Series

The Mosher series consists of deep, moderately well drained soils formed in alluvium on terraces and uplands. Permeability is very slow. Slopes range from 0 to 2 percent.

Mosher soils are similar to Carter soils and commonly are near Bon, Jerauld, Onita, and Reliance soils. Carter soils contain more clay throughout than the Mosher soils. Bon, Onita, and Reliance soils do not have a natric horizon. Bon soils are on flood plains, Onita soils are in upland swales, and Reliance soils are on uplands. Jerauld soils have visible salts within a depth of 16 inches. They are slightly lower on the landscape than the Mosher soils.

Typical pedon of Mosher silt loam, 246 feet east and 120 feet north of the southwest corner of sec. 30, T. 96 N., R. 73 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; many roots; slightly acid; clear wavy boundary.
A—5 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; many roots; slightly acid; clear wavy boundary.
E—8 to 12 inches; gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, very friable; common roots; slightly acid; abrupt wavy boundary.
Bt1—12 to 14 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure parting to moderate fine and medium blocky; extremely hard, very firm, sticky and plastic; tops and upper sides of columns thinly coated with light gray (10YR 7/2) silt grains; shiny surfaces on peds; common roots; neutral; clear wavy boundary.
Bt2—14 to 19 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine blocky; extremely hard, very firm, sticky and plastic; shiny surfaces on peds; common roots; mildly alkaline; clear wavy boundary.
BCz—19 to 25 inches; pale brown (10YR 6/3) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine accumulations of salts and gypsum; few fine roots; violent effervescence; strongly alkaline; clear wavy boundary.
Cz—25 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine accumulations of salts; violent effervescence; moderately alkaline; gradual wavy boundary.
Ck—34 to 60 inches; light gray (2.5Y 7/2) sandy loam, light brownish gray (2.5Y 6/2) moist; massive; soft, very friable; many fine accumulations of carbonate; violent effervescence; strongly alkaline.

The thickness of the solum ranges from 20 to 35 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to free carbonates ranges from 15 to 35 inches. Visible salt crystals are below a depth of 16 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is silt loam but in some

pedons is loam. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (2 to 4 moist), and chroma of 1 to 3. It is clay or clay loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It typically is stratified gravelly sand to silty clay.

Munjor Series

The Munjor series consists of deep, well drained soils formed in loamy and sandy alluvium on the flood plain along the Missouri River. Permeability is moderately rapid. Slopes range from 0 to 2 percent.

Munjor soils are similar to Haynie Variant soils and commonly are near Haynie Variant and Inavale soils. Haynie Variant soils contain more silt and less sand between depths of 10 and 40 inches than the Munjor soils. They are in positions on the landscape similar to those of the Munjor soils. Inavale soils contain more sand and less clay between depths of 10 and 40 inches than the Munjor soil. They are adjacent to the Missouri River.

Typical pedon of Munjor fine sandy loam, in an area of Haynie Variant-Munjor complex, 1,000 feet north and 668 feet west of the southeast corner of sec. 21, T. 95 N., R. 65 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—8 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

C2—12 to 22 inches; light brownish gray (10YR 6/2) loamy very fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; few fine roots; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—22 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; few fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

C4—30 to 60 inches; light gray (10YR 7/2) fine sandy loam stratified with thin layers of silt loam and silty clay loam; grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 3 to 15 inches and corresponds to the thickness of the A horizon. Free carbonates are at the surface. The soils are mildly alkaline or moderately alkaline throughout.

The A horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 or 3. It dominantly is fine sandy loam but in some pedons is sandy loam. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It dominantly is loamy very fine sand or fine sandy loam.

Okaton Series

The Okaton series consists of shallow, well drained soils formed in clayey shale residuum on uplands. Permeability is slow. Slopes range from 9 to 50 percent.

Okaton soils are similar to Lakoma and Sansarc soils and commonly are near Boro, Labu, Lakoma, Mariaville, and Sansarc soils. Boro, Labu, and Lakoma soils are more than 20 inches deep over shale. They are lower on the landscape than the Okaton soils. Mariaville soils contain less clay throughout than the Okaton soils and are 10 to 20 inches deep over siltstone. They are in positions on the landscape similar to those of the Okaton soils. Sansarc soils contain more clay than the Okaton soils and have a lower content of free carbonates and gypsum.

Typical pedon of Okaton silty clay, in an area of Lakoma-Okaton silty clays, 9 to 15 percent slopes, 1,755 feet east and 800 feet south of the northwest corner of sec. 7, T. 98 N., R. 73 W.

A—0 to 4 inches; light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; weak fine granular structure; slightly hard, friable, very sticky and plastic; violent effervescence; mildly alkaline; abrupt wavy boundary.

AC—4 to 9 inches; pale yellow (2.5Y 7/4) and light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; weak medium and fine subangular blocky structure parting to weak medium granular; slightly hard, friable, sticky and plastic; few shale fragments; common fine gypsum crystals; violent effervescence; mildly alkaline; clear wavy boundary.

Cy—9 to 15 inches; light yellowish brown (2.5Y 6/4) very shaly clay, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, sticky and plastic; about 50 percent shale fragments; many nests and threads of gypsum and few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Cr—15 to 60 inches; pale yellow (2.5Y 7/4) and light olive brown (2.5Y 5/4) shale, light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) moist; many nests of gypsum between shale plates; strong effervescence; mildly alkaline.

The depth to shale ranges from 8 to 20 inches. The soils are mildly alkaline or moderately alkaline throughout.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is silty clay,

clay, or bouldery silty clay. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is very shaly clay in which the content of shale fragments ranges from 50 to 90 percent. The Cr horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4.

O'Neill Series

The O'Neill series consists of well drained soils that are moderately deep over sandy material. These soils formed in alluvium on terraces. Permeability is moderately rapid in the solum and very rapid in the underlying material. Slopes range from 3 to 9 percent.

O'Neill soils commonly are near Anselmo, Jansen, Meadin, Platte, and Ree soils. Anselmo soils do not have coarse sand in the underlying material. They generally are lower on the landscape than the O'Neill soils. Jansen and Ree soils have an argillic horizon. They are in positions on the landscape similar to those of the O'Neill soils. Meadin soils are less than 20 inches deep over gravelly sand. They generally are on the steeper parts of the landscape. The poorly drained Platte soils are on flood plains.

Typical pedon of O'Neill fine sandy loam, 3 to 9 percent slopes, 315 feet north and 200 feet west of the southeast corner of sec. 23, T. 97 N., R. 72 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; many fine roots; medium acid; clear wavy boundary.

A2—4 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; common fine roots; medium acid; clear wavy boundary.

Bw1—10 to 16 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; soft, very friable; few fine roots; neutral; clear wavy boundary.

Bw2—16 to 23 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine subangular blocky and weak fine granular; soft, very friable; few fine roots; neutral; gradual wavy boundary.

2C—23 to 60 inches; multicolored sand and coarse sand; loose; neutral.

The thickness of the solum, or the depth to sandy material, ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is fine sandy loam and sandy loam but in some pedons is loamy fine sand or loam. The B horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 to 4. It is fine sandy loam or sandy loam. The 2C horizon is coarse sand, gravelly sand, or sand.

Onita Series

The Onita series consists of deep, well drained and moderately well drained soils that formed in local alluvium in swales and on broad flats in the uplands. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Onita soils are similar to Witten soils and commonly are near Agar, Brocksburg, Jansen, Ree, and Reliance soils. Agar soils contain less clay in the subsoil than the Onita soils. Brocksburg and Jansen soils are moderately deep over sandy material. Ree and Reliance soils have a mollic epipedon that is less than 20 inches thick. Witten soils contain more clay throughout than the Onita soils. Agar, Jansen, Ree, and Reliance soils are slightly higher on the landscape than the Onita soils. Brocksburg soils are in positions on the landscape similar to those of the Onita soils.

Typical pedon of Onita silt loam, occasionally flooded, 150 feet south and 2,470 feet west of the northeast corner of sec. 10, T. 97 N., R. 72 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; medium acid; abrupt wavy boundary.

A—8 to 12 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common roots; medium acid; clear wavy boundary.

Bt1—12 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; shiny surfaces on peds; few roots; slightly acid; clear wavy boundary.

Bt2—20 to 26 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; shiny surfaces on peds; few roots; slightly acid; gradual wavy boundary.

Bt3—26 to 32 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate fine blocky; hard, friable, sticky and plastic; shiny surfaces on peds; few roots; neutral; gradual wavy boundary.

BC—32 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium

subangular blocky; hard, friable, sticky and plastic; few roots; strong effervescence; mildly alkaline; gradual wavy boundary.

Ck—38 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common medium accumulations of carbonate; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 54 inches. The thickness of the mollic epipedon ranges from 20 to 40 inches. The depth to free carbonates ranges from 22 to more than 40 inches. In some pedons stratified loam, clay loam, or clay is at a depth of 40 to 60 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It dominantly is silt loam but in some pedons is clay loam or silty clay loam. It ranges from medium acid to neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 to 3. It is slightly acid or neutral. It is silty clay loam, silty clay, or clay loam. The content of clay in this horizon ranges from 35 to 50 percent. Some pedons have a BCk horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silty clay loam, clay loam, or silt loam. It is mildly alkaline or moderately alkaline.

Platte Series

The Platte series consists of poorly drained soils on flood plains. These soils are shallow over gravelly sand. They formed in alluvium. Permeability is moderate in the loamy material and very rapid in the gravelly underlying material. Slopes range from 0 to 2 percent.

Platte soils commonly are near Bon, Cass, and Inavale soils. Bon and Inavale soils are in positions on the landscape similar to those of the Platte soils. Bon soils are not underlain by gravelly material. The somewhat excessively drained Inavale soils do not have a seasonal high water table within a depth of 5 feet. The well drained Cass soils are higher on the landscape than the Platte soils. Also, they contain less sand throughout.

Typical pedon of Platte loam, 220 feet north and 2,490 feet west of the southeast corner of sec. 24, T. 95 N., R. 72 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; many roots; slight effervescence; moderately alkaline; clear smooth boundary.

A2—4 to 9 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; thin strata of grayish brown (10YR 5/2) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; few roots; neutral; clear wavy boundary.

AC—9 to 14 inches; dark gray (10YR 4/1) sandy loam, very dark grayish brown (10YR 3/2) moist; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium granular structure; slightly hard, very friable; few fine roots; neutral; gradual wavy boundary.

2C—14 to 60 inches; multicolored gravelly coarse sand; single grain; loose; neutral.

The thickness of the solum ranges from 6 to 14 inches. The depth to gravelly material ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is loam but in some pedons is silt loam or fine sandy loam. Some pedons have a C horizon. This horizon has value of 6 or 7 (5 or 6 moist) and chroma of 1 or 2. It is sandy loam or loamy very fine sand. The 2C horizon is multicolored sand and gravel.

Promise Series

The Promise series consists of deep, well drained soils formed in sediments weathered from clayey shale on uplands. Permeability is very slow. Slopes range from 0 to 9 percent.

Promise soils are similar to Labu, Millboro, and Witten soils and commonly are near Boro, Labu, Wendte, and Witten soils. Boro and Labu soils do not have a mollic epipedon. They are higher on the landscape than the Promise soils. Millboro and Witten soils have an argillic horizon and contain less clay throughout than the Promise soils. The moderately well drained Wendte soils are on narrow flood plains.

Typical pedon of Promise clay, 0 to 3 percent slopes, 375 feet north and 1,200 feet east of the southwest corner of sec. 7, T. 98 N., R. 73 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay, very dark brown (10YR 2/2) moist; weak medium and coarse granular structure; hard, friable, slightly sticky and plastic; neutral; abrupt wavy boundary.

A—5 to 10 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; slight effervescence; neutral; gradual wavy boundary.

Bw1—10 to 21 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium blocky; extremely hard, very firm, sticky and plastic; slight effervescence; mildly alkaline; gradual wavy boundary.

Bw2—21 to 31 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate

medium and coarse prismatic structure parting to moderate medium blocky; extremely hard, very firm, sticky and plastic; evident pressure faces; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

BCy—31 to 36 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; evident pressure faces; few fine nests of gypsum; strong effervescence; mildly alkaline; gradual wavy boundary.

Cy—36 to 51 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; common fine nests of gypsum; violent effervescence; mildly alkaline; gradual wavy boundary.

C—51 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 42 inches. The thickness of the mollic epipedon ranges from 7 to 15 inches. Free carbonates are at the surface in some pedons. In some pedons shale is at a depth of 40 to 60 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is clay but in some pedons is silty clay. The Bw horizon has hue of 2.5Y or 5Y, value of 4 to 6 (2 to 4 moist), and chroma of 1 or 2. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is clay or silty clay.

Ree Series

The Ree series consists of deep, well drained soils formed in loamy material on uplands. Permeability is moderate. Slopes range from 0 to 9 percent.

Ree soils are similar to Jansen and Reliance soils and commonly are near Holt, Jansen, Onita, Reliance, and Tassel soils. Holt soils contain more sand and less clay in the subsoil than the Ree soils. They are in positions on the landscape similar to those of the Ree soils. Jansen soils are underlain by gravelly material at a depth of 20 to 40 inches. Onita soils are in swales. They have a mollic epipedon that is more than 20 inches thick. Reliance soils contain more clay and less sand in the subsoil than the Ree soils. Tassel soils are higher on the landscape than the Ree soils. They are 6 to 20 inches deep over sandstone.

Typical pedon of Ree loam, 3 to 6 percent slopes, 2,570 feet north and 90 feet east of the southwest corner of sec. 16, T. 97 N., R. 71 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many roots; slightly acid; abrupt wavy boundary.

BA—8 to 17 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.

Bt—17 to 30 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common roots; neutral; clear wavy boundary.

BC—30 to 33 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable; few fine roots; mildly alkaline; clear wavy boundary.

Ck—33 to 42 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; few fine roots; common medium accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

C—42 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 36 inches. The depth to free carbonates ranges from 14 to 44 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It dominantly is loam but in some pedons is silt loam. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 to 4. It is neutral or mildly alkaline. It is clay loam, silty clay loam, or sandy clay loam. The clay content in this horizon ranges from 27 to 35 percent. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. It is clay loam, loam, or fine sandy loam. Fine sand, gravel, or clay is below a depth of 40 inches in some pedons.

Ree loam, gravelly substratum, 0 to 2 percent slopes, contains more clay in the subsoil than is defined as the range for the series. This difference, however, does not significantly alter the usefulness or behavior of the soil.

Reliance Series

The Reliance series consists of deep, well drained soils formed in loess on uplands. Permeability is moderately slow. Slopes range from 0 to 15 percent.

Reliance soils are similar to Millboro and Ree soils and commonly are near Millboro, Onita, Ree, and Scott soils. Millboro soils contain more clay throughout than the Reliance soils. Also, they are lower on the landscape.

The moderately well drained Onita soils are in swales. Ree soils contain more sand and less clay throughout than the Reliance soils. The poorly drained Scott soils are in depressions.

Typical pedon of Reliance silty clay loam, 0 to 3 percent slopes, 110 feet north and 1,100 feet east of the southwest corner of sec. 25, T. 98 N., R. 71 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; hard, friable; neutral; abrupt smooth boundary.

Bt1—7 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, slightly sticky and slightly plastic; many tongues, very dark brown (10YR 2/2) moist; organic coatings on faces of peds; mildly alkaline; clear wavy boundary.

Bt2—12 to 22 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to strong medium and fine blocky; hard, firm, slightly sticky and slightly plastic; shiny surfaces on peds; few tongues, very dark brown (10YR 2/2) moist; mildly alkaline; abrupt wavy boundary.

Btk—22 to 26 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium and fine blocky and subangular blocky; hard, firm, slightly sticky and slightly plastic; shiny surfaces on peds; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

BCk—26 to 33 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium blocky; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Ck—33 to 41 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; hard, friable; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—41 to 60 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; hard, friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 48 inches. The depth to free carbonates ranges from 18 to 36 inches. The thickness of the mollic epipedon ranges from 7 to 18 inches after mixing.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is silty clay loam but in some pedons is silt loam. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 2 to 4. It is silty clay loam or silty clay. It is neutral or mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silty clay loam or silt loam. It is mildly alkaline or moderately alkaline. In some pedons clay, gravel, or weakly cemented sandstone is at a depth of 40 to 60 inches.

Sansarc Series

The Sansarc series consists of shallow, well drained soils formed in clayey shale residuum on uplands. Permeability is slow. Slopes range from 9 to 50 percent.

Sansarc soils are similar to Okaton soils and commonly are near Coly, Labu, Mariaville, Okaton, and Wendte soils. The deep, silty Coly soils contain less clay throughout than the Sansarc soils. Also, they generally are higher on the landscape. Labu soils are moderately deep over shale. They are on smooth slopes. Mariaville soils are 10 to 20 inches deep over siltstone and contain less clay throughout than the Sansarc soils. Also, they are higher on the landscape. Okaton soils contain less clay than the Sansarc soils and have a higher content of free carbonates and gypsum. The moderately well drained Wendte soils are on narrow flood plains.

Typical pedon of Sansarc clay, in an area of Labu-Sansarc clays, 15 to 50 percent slopes, 750 feet north and 780 feet east of the southwest corner of sec. 2, T. 98 N., R. 72 W.

A—0 to 4 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, friable, sticky and plastic; many roots; slight effervescence; neutral; clear wavy boundary.

C1—4 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak medium and fine subangular blocky; slightly hard, friable, sticky and plastic; about 20 percent fine shale fragments; few roots; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—14 to 18 inches; light olive gray (5Y 6/2) shaly clay, olive gray (5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few roots; few fine accumulations of carbonate; about 30 percent shale fragments; slight effervescence; mildly alkaline; clear wavy boundary.

Cr—18 to 60 inches; light olive gray (5Y 6/2) shale, olive gray (5Y 4/2) moist; neutral.

The depth to shale ranges from 4 to 20 inches. The A horizon has hue of 2.5Y, 5Y, or 10YR and value of 4 to 7 (3 to 5 moist). It dominantly is clay but in some pedons

is silty clay. It ranges from neutral to moderately alkaline. The C horizon has hue of 5Y or 2.5Y. It is clay, shaly clay, or very shaly clay. It is mildly alkaline or moderately alkaline. In some pedons gypsum crystals are in the upper part of the Cr horizon.

Scott Series

The Scott series consists of deep, poorly drained soils formed in silty and clayey alluvium in depressions on uplands. Permeability is very slow in the subsoil and moderate in the underlying material. Slopes are less than 1 percent.

These soils have a slightly thicker A horizon, a darker E horizon, free carbonates closer to the surface, and a more alkaline parent material than is defined as the range for the Scott series. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Scott soils commonly are near Agar, Jansen, Mosher, Onita, and Reliance soils. The well drained Agar, Jansen, and Reliance soils are higher on the landscape than the Scott soils. Mosher soils have a natric horizon. They are on the slightly higher concave parts of the landscape. The moderately well drained Onita soils are in swales.

Typical pedon of Scott silt loam, 70 feet north and 1,372 feet east of the southwest corner of sec. 13, T. 98 N., R. 72 W.

Ap—0 to 8 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy and fine granular structure; soft, very friable; many roots; slightly acid; abrupt smooth boundary.

E—8 to 9 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky and moderate medium platy structure; hard, friable; many roots; medium acid; abrupt smooth boundary.

Bt—9 to 17 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong coarse prismatic structure; very hard, very firm, sticky and plastic; shiny surfaces on peds; many roots; neutral; clear wavy boundary.

Btk—17 to 28 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong coarse prismatic structure; hard, firm, sticky and plastic; shiny surfaces on peds; many roots; common coarse accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

BCk—28 to 32 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few roots; common fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Cg1—32 to 37 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

Cg2—37 to 46 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few medium distinct yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

Cg3—46 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very hard, friable, slightly sticky and plastic; few fine accumulations of carbonate; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 27 to 48 inches. The depth to free carbonates ranges from 15 to 50 inches. The thickness of the mollic epipedon ranges from 20 to 35 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is silt loam but in some pedons is silty clay loam. It ranges from medium acid to neutral. The E horizon has value of 5 or 6 (3 to 5 moist) and chroma of 1. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 or 2. It is silty clay or clay. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is silt loam or silty clay loam.

Tassel Series

The Tassel series consists of shallow, well drained soils formed in sandstone residuum on uplands. Permeability is moderately rapid. Slopes range from 3 to 30 percent.

These soils receive somewhat more precipitation than is definitive for the series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Tassel soils are similar to Mariaville soils and commonly are near Anselmo, Holt, Ree, Reliance, and Valentine soils. The nearby soils generally are lower on the landscape than the Tassel soils. Anselmo and Holt soils are more than 20 inches deep over sandstone. Mariaville soils contain more silt and less sand than the Tassel soils. The deep Ree and Reliance soils have a mollic epipedon. The deep Valentine soils are sandy throughout.

Typical pedon of Tassel fine sandy loam, in an area of Tassel-Rock outcrop complex, 9 to 30 percent slopes, 570 feet east and 1,090 feet south of the northwest corner of sec. 31, T. 97 N., R. 73 W.

A—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak

fine granular structure; slightly hard, very friable; many roots; violent effervescence; mildly alkaline; gradual wavy boundary.
C—7 to 14 inches; light gray (2.5Y 7/2) fine sandy loam, light brownish gray (2.5Y 6/2) moist; weak coarse subangular blocky structure parting to single grain; slightly hard, friable; common roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.
Cr—14 to 60 inches; pale yellow (5Y 7/3) sandstone, light brownish gray (2.5Y 6/2) moist; strong effervescence; mildly alkaline.

The depth to sandstone ranges from 6 to 20 inches. The soils typically contain free carbonates throughout, but in some pedons the surface layer is noncalcareous.

The A horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It dominantly is fine sandy loam but in some pedons is very fine sandy loam or loamy fine sand. It is 3 to 8 inches thick. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 6 or 7 (4 to 6 moist), and chroma of 2 or 3.

Uly Series

The Uly series consists of deep, well drained soils formed in loess on uplands. Permeability is moderate. Slopes range from 0 to 6 percent.

Uly soils are similar to Agar soils and commonly are near Coly soils. Agar soils have an argillic horizon. Coly soils do not have a mollic epipedon. They generally are higher on the landscape than the Uly soils.

Typical pedon of Uly silt loam, 2 to 6 percent slopes, 2,130 feet west and 2,280 feet south of the northeast corner of sec. 1, T. 99 N., R. 71 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many roots; neutral; abrupt wavy boundary.
BA—8 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; many roots; neutral; clear wavy boundary.
Bw—10 to 20 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; many roots; strong effervescence; mildly alkaline; gradual wavy boundary.
BC—20 to 30 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, very friable; common roots; few fine accumulations of carbonate; violent effervescence; mildly alkaline; clear wavy boundary.
C—30 to 60 inches; pale brown (10YR 6/3) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; few fine accumulations of carbonate; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 14 to 36 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches. The depth to free carbonates ranges from 8 to 22 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 2. It ranges from slightly acid to mildly alkaline. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6 (4 or 5 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Valentine Series

The Valentine series consists of deep, excessively drained soils formed in sandy material on uplands. Permeability is rapid. Slopes range from 3 to 18 percent.

Valentine soils commonly are near Dunday and Tassel soils. Dunday soils have a mollic epipedon. They are slightly lower on the landscape than the Valentine soils. Tassel soils are 6 to 20 inches deep over sandstone. They are higher on the landscape than the Valentine soils.

Typical pedon of Valentine loamy fine sand, 3 to 9 percent slopes, 150 feet north and 100 feet west of the southeast corner of sec. 17, T. 97 N., R. 71 W.

A—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; many fine roots; neutral; clear wavy boundary.
AC—6 to 13 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to single grain; soft, very friable; many fine roots; neutral; gradual wavy boundary.
C1—13 to 28 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; weak coarse subangular blocky structure parting to single grain; soft, very friable; common fine roots; neutral; gradual wavy boundary.
C2—28 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 5 to 17 inches. The soils are slightly acid or neutral throughout. They dominantly are loamy fine sand or fine sand throughout, but the range includes loamy sand.

The A horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4.

Vetal Series

The Vetal series consists of deep, well drained soils formed in loamy alluvium in swales on uplands. Permeability is moderately rapid. Slopes range from 0 to 3 percent.

Vetal soils are similar to Anselmo soils and commonly are near Anselmo, Cass, Dunday, and Whitelake soils. Anselmo soils have a mollic epipedon that is less than 20 inches thick. The stratified Cass soils are on flood plains. The sandy Dunday soils are higher on the landscape than the Vetal soils. Whitelake soils have a natric horizon. They are in positions on the landscape similar to those of the Vetal soils.

Typical pedon of Vetal fine sandy loam, 195 feet north and 1,130 feet east of the southwest corner of sec. 10, T. 97 N., R. 72 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt wavy boundary.

A—7 to 23 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; many roots; mildly alkaline; gradual wavy boundary.

AC—23 to 35 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few roots; mildly alkaline; gradual wavy boundary.

C—35 to 60 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; neutral.

The thickness of the solum ranges from 28 to 40 inches. The thickness of the mollic epipedon ranges from 20 to 35 inches. Free carbonates are below a depth of 30 inches in some pedons.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is fine sandy loam but in some pedons is loam or sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is loam, fine sandy loam, sandy loam, or loamy fine sand. Buried horizons are below a depth of 30 inches in some pedons.

Wendte Series

The Wendte series consists of deep, moderately well drained soils formed in clayey and silty alluvium on flood plains. Permeability is slow. Slopes range from 0 to 2 percent.

Wendte soils commonly are near Carter, Haynie Variant, Hurley, Munjor, Promise, and Witten soils. Carter, Hurley, Promise, and Witten soils are not stratified. Carter, Hurley, and Promise soils are on uplands, and Witten soils are in upland swales. The well drained Haynie Variant and Munjor soils are on the flood plain along the Missouri River.

Typical pedon of Wendte silty clay, channeled, 896 feet west and 720 feet north of the southeast corner of sec. 11, T. 99 N., R. 72 W.

A—0 to 5 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky and thin platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and plastic; many roots; strong effervescence; mildly alkaline; clear wavy boundary.

C1—5 to 10 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; thin light brownish gray (10YR 6/2) strata; weak medium subangular blocky structure parting to moderate fine granular; hard, friable, sticky and plastic; many roots; strong effervescence; mildly alkaline; clear wavy boundary.

C2—10 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; thin pale brown (10YR 6/3) strata, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

C3—18 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; thin light brownish gray (10YR 6/2) strata; hard, friable, sticky and plastic; common roots; few fine threads of gypsum; strong effervescence; mildly alkaline; gradual wavy boundary.

C4—36 to 60 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) stratified silty clay and silty clay loam, dark grayish brown (2.5Y 4/2) moist; many fine distinct brownish yellow (10YR 6/6) mottles; hard, firm, sticky and plastic; few fine threads of gypsum; strong effervescence; mildly alkaline.

Typically, the soils are calcareous throughout, but in some pedons thin layers are noncalcareous. In some pedons a buried A horizon is below a depth of 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is silty clay but in some pedons is silty clay loam or clay. It is 5 to 8 inches thick. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 2 to 4. It is stratified silty clay, silty clay loam, clay, or

clay loam. In some pedons thin layers of sand are at a depth of 40 to 60 inches.

Wewela Series

The Wewela series consists of moderately deep, well drained soils formed in loamy material and the underlying clayey shale residuum. These soils are on uplands. Permeability is moderate in the upper part of the profile and slow in the underlying material. Slopes range from 2 to 9 percent.

These soils contain less clay in the Bt horizon than is definitive for the Wewela series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Wewela soils commonly are near Anselmo, Holt, Lakoma, and Vetal soils. Anselmo and Vetal soils contain more sand and less clay in the lower part than the Wewela soils. Holt soils are 20 to 40 inches deep over sandstone. Lakoma soils do not have a mollic epipedon and contain more clay and less sand in the upper part than the Wewela soils. Anselmo soils are in positions on the landscape similar to those of the Wewela soils. Holt and Lakoma soils are higher on the landscape than the Wewela soils. Vetal soils are in swales.

Typical pedon of Wewela fine sandy loam, in an area of Lakoma-Wewela complex, 2 to 6 percent slopes, 78 feet north and 2,410 feet east of the southwest corner of sec. 22, T. 95 N., R. 73 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt wavy boundary.

A—5 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; clear wavy boundary.

Bt—7 to 21 inches; light olive brown (2.5Y 5/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; shiny surfaces on peds; neutral; abrupt wavy boundary.

2BC—21 to 29 inches; light olive brown (2.5Y 5/4) clay, light olive brown (2.5Y 5/4) moist; dark grayish brown (10YR 4/2) coatings on faces of peds; strong coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and very plastic; neutral; clear wavy boundary.

2Ck—29 to 36 inches; light yellowish brown (2.5Y 6/4) and yellow (2.5Y 7/6) shaly silty clay, yellowish brown (10YR 5/6) and light yellowish brown (2.5Y 6/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; about 50 percent shale fragments; many medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

2Cr—36 to 60 inches; multicolored shale; hard, brittle; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 14 to 35 inches. The mollic epipedon is 7 to 10 inches thick. The depth to free carbonates ranges from 18 to 36 inches. The depth to shale ranges from 22 to 36 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is fine sandy loam but in some pedons is loam or loamy fine sand. It is slightly acid or neutral. The Bt horizon also is slightly acid or neutral. It has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4. It is fine sandy loam, clay loam, loam, or sandy clay loam. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 2 to 8. It ranges from neutral to moderately alkaline.

Whitelake Series

The Whitelake series consists of deep, moderately well drained soils formed in loamy material on uplands and terraces. Permeability is slow in the subsoil and moderately rapid in the underlying material. Slopes range from 0 to 2 percent.

Whitelake soils commonly are near Fedora and Vetal soils. The nearby soils do not have a natric horizon. Fedora soils are on flood plains, and Vetal soils are in upland swales.

Typical pedon of Whitelake fine sandy loam, 930 feet east and 2,580 feet south of the northwest corner of sec. 13, T. 97 N., R. 72 W.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; many roots; medium acid; clear wavy boundary.

A2—6 to 13 inches; very dark grayish brown (10YR 3/2) fine sandy loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable; many roots; medium acid; abrupt wavy boundary.

E—13 to 15 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; many roots; slightly acid; abrupt wavy boundary.

Bt1—15 to 24 inches; grayish brown (10YR 5/2) fine sandy loam that has light brownish gray (10YR 6/2) streaks; dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to weak coarse subangular blocky; very hard, friable, slightly sticky; common roots; mildly alkaline; clear wavy boundary.

Bt2—24 to 30 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 5/3) moist; weak coarse

prismatic structure; very hard, firm, slightly sticky and slightly plastic; common roots; few fine accumulations of carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

BC—30 to 35 inches; yellowish brown (10YR 5/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; hard, friable; few roots; few fine accumulations of carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—35 to 48 inches; pale yellow (2.5Y 7/4) fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; soft, friable; slight effervescence; strongly alkaline; gradual wavy boundary.

C2—48 to 60 inches; light gray (2.5Y 7/2) very fine sandy loam, light brownish gray (2.5Y 6/2) moist; massive; soft, very friable; slight effervescence; strongly alkaline.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to free carbonates ranges from 15 to 30 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 to 3. It dominantly is fine sandy loam but in some pedons is very fine sandy loam or loamy fine sand. It is 10 to 16 inches thick. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is fine sandy loam, sandy loam, or loamy fine sand. The A and E horizons range from medium acid to mildly alkaline. The Bt horizon has value of 5 or 6 (3 to 5 moist) and chroma of 2 or 3. It is sandy clay loam or fine sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It ranges from silt loam to sand. The B and C horizons range from mildly alkaline to very strongly alkaline.

Witten Series

The Witten series consists of deep, moderately well drained soils formed in clayey alluvium in swales on uplands. Permeability is slow. Slopes range from 0 to 3 percent.

Witten soils are similar to Onita and Promise soils and commonly are near Carter, Hurley, Kolls, Millboro, Promise, and Wendte soils. Carter, Hurley, and Promise soils are in positions on the landscape similar to those of the Witten soils. Carter and Promise soils contain more clay in the subsoil than the Witten soils, and Hurley soils have a natric horizon. The poorly drained Kolls soils are in depressions. Millboro soils have a mollic epipedon that is less than 20 inches thick. They are higher on the landscape than the Witten soils. Onita soils contain less clay throughout than the Witten soils. The stratified Wendte soils are on flood plains.

Typical pedon of Witten silty clay, 145 feet west and 270 feet north of the southeast corner of sec. 22, T. 98 N., R. 73 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium granular structure; very hard, firm, very sticky and very plastic; neutral; clear wavy boundary.

A—6 to 11 inches; dark gray (10YR 4/1) silty clay, very dark brown (10YR 2/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; very hard, firm, very sticky and very plastic; few roots; mildly alkaline; clear wavy boundary.

Bt—11 to 28 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse subangular blocky structure parting to moderate fine blocky; extremely hard, firm, very sticky and very plastic; shiny surfaces on peds; few dark gray tongues; few roots; strong effervescence; mildly alkaline; clear wavy boundary.

BC—28 to 39 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure parting to moderate fine blocky; extremely hard, very firm, very sticky and very plastic; shiny surfaces on peds; few roots; few medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Cy—39 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; few fine threads of gypsum; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 45 inches. The thickness of the mollic epipedon ranges from 20 to 34 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is silty clay but in some pedons is clay. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay or silty clay. The clay content in this horizon ranges from 50 to 60 percent. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3.

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Usually, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Gregory County.

Climate

Climate directly influences the rate of chemical and physical weathering. Gregory County has a continential climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to an average depth of 20 inches or more. The climate generally is uniform throughout the county and thus as a separate factor does not differentiate the soils within the county. Additional climatic data are given under the heading "General Nature of the County."

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Gregory County the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter. Onita soils are an example.

Earthworms, insects, and burrowing animals help to keep the soils open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients that plants use as food.

Parent Material

Parent material is the unconsolidated organic and mineral material in which soil forms. It determines many of the chemical and physical characteristics of the soil, such as color, texture, reaction, and consistence. The rate of soil formation is more rapid in the more friable loamy and silty parent material than in other kinds of parent material. Also, more changes take place, and the horizons are more distinct.

The soils in Gregory County formed in material weathered from the underlying geologic formations and in material transported and redeposited by wind and water.

The bedrock in Gregory County dominantly is marine shale of the Pierre Formation that was deposited during the Late Cretaceous Period and calcareous sandstone of the Ash Hollow Formation (*6*). Scattered remnants of the Brule Formation occur as rimrock areas above the Pierre Formation in the eastern part of the county.

The Pierre shale is dark gray to light gray and has beds of bentonite and seams of limestone, iron, and manganese concretions. Labu, Lakoma, Okaton, and Sansarc are examples of soils that formed in material weathered from the Pierre Formation. The soils on most of the breaks along Lake Francis Case formed in this material.

The bedrock of the Ash Hollow Formation mainly is very light gray to green, weakly cemented, fine grained, calcareous sandstone. Holt and Tassel are examples of soils that formed in material weathered from the Ash Hollow Formation. Mariaville and other soils formed in material weathered from siltstone in the Brule Formation.

Loess and eolian sand are two kinds of wind-deposited parent material in the county. Loess mantles the uplands, mainly those in areas of the Reliance and Agar associations, which are described under the heading "General Soil Map Units." It also mantles scattered areas adjacent to Lake Francis Case. These

areas are in the Labu-Sansarc association. Agar, Coly, Reliance, and Uly are examples of soils that formed in this silty loess. Widely scattered deposits of eolian sand are in areas of the Anselmo-Holt-Tassel association. Dunday and Valentine are examples of soils that formed in this sandy material.

The alluvium in Gregory County is recently deposited clayey to sandy material on the flood plains along drainageways and in upland depressions. It also is deposited on nearly level to steep terraces that are not identified with the present drainage system. Bon, Haynie Variant, Inavale, and Wendte are examples of soils that formed in alluvium on flood plains. Kolls, Onita, and Scott are examples of soils that formed partly or entirely in local alluvium washed in from the more sloping adjacent soils in the uplands. Meadin and O'Neill are examples of soils that formed in alluvium on terraces. They are loamy soils underlain by coarse sand or gravelly coarse sand.

Relief

Relief affects soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Coly soils, much of the rainfall is lost through runoff and thus does not penetrate the surface. Much of the surface soil is lost through erosion. As a result, these soils have a thin surface layer and are calcareous at or near the surface. Runoff is less rapid on Agar, Ree, and other less sloping soils, and more moisture penetrates the surface. These soils are calcareous at a greater depth than the Coly soils. Also, the horizons in which organic matter accumulates are thicker.

Scott soils are in depressions where water ponds. They have the colors characteristic of poorly drained soils. The Onita soils in swales receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the slightly higher adjacent Reliance soils.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that form. The degree of profile development reflects the age of a soil. The oldest soils are on parts of the landscape that have been stable for the longest time. In Gregory County these are the Reliance and Ree soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Coly soils are an example of young soils that are subject to natural erosion, and Bon soils are an example of young alluvial soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Growing crops in rows or strips that follow the contour.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes recognized in this survey are—

	Inches
Deep	more than 40
Moderately deep	20 to 40
Shallow	less than 20

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes recognized in this survey area are—

	Percent
Nearly level	0 to 3
Gently sloping	3 to 6
Moderately sloping	6 to 9
Strongly sloping	9 to 15
Moderately steep	15 to 25
Steep	25 to 40
Very steep	more than 40

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded and 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. Includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-78 at Gregory, S. Dak.]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	31.5	6.9	19.2	63	-23	13	0.50	0.24	0.72	2	6.6
February---	37.7	12.9	25.3	70	-19	39	.91	.24	1.44	3	10.1
March------	45.6	20.9	33.3	79	-11	98	1.52	.50	2.35	4	11.1
April------	61.6	33.9	47.7	90	13	262	2.83	1.38	4.07	6	4.7
May--------	72.8	45.1	59.0	93	25	589	3.24	1.81	4.50	7	.4
June-------	82.0	54.7	68.3	102	37	849	3.97	2.58	5.22	7	.0
July-------	89.1	60.3	74.7	105	43	1,076	2.83	1.21	4.19	6	.0
August-----	88.2	58.5	73.4	104	42	1,035	2.11	.86	3.16	5	.0
September--	78.3	48.4	63.3	100	27	699	2.09	.70	3.23	4	.0
October----	67.3	37.3	52.3	93	17	394	1.23	.38	1.94	3	1.4
November---	48.6	23.1	35.9	80	-4	68	.95	.25	1.49	2	7.1
December---	36.1	12.8	24.5	64	-17	21	.68	.25	1.02	2	8.2
Yearly:											
Average--	61.6	34.6	48.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	106	-24	---	---	---	---	---	---
Total----	---	---	---	---	---	5,143	22.86	17.32	27.73	51	49.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-78 at Gregory, S. Dak.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 3	May 16	May 27
2 years in 10 later than--	April 28	May 10	May 21
5 years in 10 later than--	April 17	April 29	May 10
First freezing temperature in fall:			
1 year in 10 earlier than--	October 5	September 27	September 18
2 years in 10 earlier than--	October 11	October 2	September 22
5 years in 10 earlier than--	October 21	October 12	October 1

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-78 at Gregory, S. Dak.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	164	143	120
8 years in 10	172	151	128
5 years in 10	186	165	143
2 years in 10	200	180	158
1 year in 10	207	187	166

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaA	Agar silt loam, 0 to 3 percent slopes	2,270	0.3
AaB	Agar silt loam, 3 to 6 percent slopes	3,675	0.6
AdC	Anselmo-Dunday complex, 3 to 9 percent slopes	2,870	0.4
AhB	Anselmo-Holt fine sandy loams, 2 to 6 percent slopes	6,490	1.0
AhC	Anselmo-Holt fine sandy loams, 6 to 9 percent slopes	4,430	0.7
AtE	Anselmo-Tassel fine sandy loams, 6 to 25 percent slopes	27,050	4.1
BaE	Betts loam, 15 to 40 percent slopes	760	0.1
Bb	Bon silt loam	3,530	0.5
Bc	Bon silt loam, channeled	11,100	1.7
BlD	Boro-Lakoma silty clays, 9 to 15 percent slopes	13,450	2.1
BmB	Boro-Millboro silty clays, 2 to 6 percent slopes	7,410	1.1
BmC	Boro-Millboro silty clays, 6 to 9 percent slopes	4,530	0.7
CaA	Carter-Hurley complex, 0 to 3 percent slopes	910	0.1
CbA	Carter-Promise complex, 0 to 3 percent slopes	2,505	0.4
Cd	Cass fine sandy loam, channeled	2,735	0.4
CrC	Coly silt loam, 6 to 9 percent slopes	1,075	0.2
CrE	Coly silt loam, 9 to 25 percent slopes	1,135	0.2
DaA	Dunday loamy fine sand, 0 to 3 percent slopes	425	0.1
Du	Durrstein silt loam	655	0.1
Fd	Fedora loam	325	*
Ha	Haynie Variant-Munjor complex	620	0.1
HoA	Holt fine sandy loam, 0 to 3 percent slopes	740	0.1
HoB	Holt fine sandy loam, 3 to 6 percent slopes	7,720	1.2
HoC	Holt fine sandy loam, 6 to 9 percent slopes	6,075	0.9
HoD	Holt fine sandy loam, 9 to 15 percent slopes	3,255	0.5
Ia	Inavale loamy sand	2,550	0.4
JaA	Jansen loam, 0 to 3 percent slopes	10,170	1.6
JaB	Jansen loam, 3 to 6 percent slopes	14,030	2.2
JaC	Jansen loam, 6 to 9 percent slopes	2,185	0.3
JbA	Jansen-Brocksburg loams, 0 to 2 percent slopes	6,185	0.9
Ko	Kolls clay	1,075	0.2
LaB	Labu clay, 2 to 6 percent slopes	1,205	0.2
LaC	Labu clay, 6 to 9 percent slopes	4,540	0.7
LaD	Labu clay, 9 to 15 percent slopes	26,640	4.2
LcF	Labu-Sansarc clays, 15 to 50 percent slopes	125,455	19.3
LoD	Lakoma-Okaton silty clays, 9 to 15 percent slopes	4,045	0.6
LwB	Lakoma-Wewela complex, 2 to 6 percent slopes	475	0.1
LwC	Lakoma-Wewela complex, 6 to 9 percent slopes	730	0.1
MaD	Mariaville loam, 6 to 15 percent slopes	2,540	0.4
MaF	Mariaville loam, 15 to 40 percent slopes	13,190	2.0
MdF	Mariaville-Labu-Anselmo complex, 15 to 40 percent slopes	1,810	0.3
MeC	Meadin sandy loam, 3 to 9 percent slopes	11,480	1.8
MeE	Meadin sandy loam, 9 to 25 percent slopes	11,530	1.8
MoA	Millboro silty clay, 0 to 2 percent slopes	5,415	0.8
MoB	Millboro silty clay, 2 to 6 percent slopes	17,975	2.9
MoC	Millboro silty clay, 6 to 9 percent slopes	2,760	0.4
MpB	Millboro-Lakoma silty clays, 2 to 6 percent slopes	2,665	0.4
MpC	Millboro-Lakoma silty clays, 6 to 9 percent slopes	10,675	1.6
Mr	Mosher silt loam	6,400	1.0
Ms	Mosher-Jerauld silt loams	3,120	0.5
ObE	Okaton-Lakoma silty clays, 15 to 50 percent slopes	53,710	8.2
OcF	Okaton-Mariaville complex, 15 to 50 percent slopes	3,190	0.5
OeC	O'Neill fine sandy loam, 3 to 9 percent slopes	1,950	0.3
On	Onita silt loam	2,180	0.3
Ot	Onita silt loam, occasionally flooded	11,380	1.8
Pg	Pits, gravel	220	*
Pm	Platte loam	1,395	0.2
PrA	Promise clay, 0 to 3 percent slopes	8,640	1.3
PrB	Promise clay, 3 to 6 percent slopes	10,200	1.6
PrC	Promise clay, 6 to 9 percent slopes	3,880	0.6
RaA	Ree loam, 0 to 3 percent slopes	3,390	0.5
RaB	Ree loam, 3 to 6 percent slopes	16,925	2.6
RaC	Ree loam, 6 to 9 percent slopes	6,195	0.9
RbA	Ree loam, gravelly substratum, 0 to 2 percent slopes	7,995	1.2
RcC	Ree-Tassel complex, 3 to 9 percent slopes	1,380	0.2
ReA	Reliance silty clay loam, 0 to 3 percent slopes	19,915	3.1
ReB	Reliance silty clay loam, 3 to 6 percent slopes	47,950	7.4
ReB2	Reliance silty clay loam, 2 to 6 percent slopes, eroded	2,265	0.3
ReC	Reliance silty clay loam, 6 to 9 percent slopes	10,345	1.6
ReC2	Reliance silty clay loam, 6 to 9 percent slopes, eroded	4,680	0.7

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
ReD	Reliance silty clay loam, 9 to 15 percent slopes	2,430	0.4
ReD2	Reliance silty clay loam, 9 to 15 percent slopes, eroded	1,630	0.2
Rv	Riverwash	90	*
ScE	Sansarc-Rock outcrop complex, 9 to 40 percent slopes	1,340	0.2
So	Scott silt loam	4,245	0.6
TrE	Tassel-Rock outcrop complex, 9 to 30 percent slopes	1,595	0.2
UlA	Uly silt loam, 0 to 2 percent slopes	275	*
UlB	Uly silt loam, 2 to 6 percent slopes	2,645	0.4
VaC	Valentine loamy fine sand, 3 to 9 percent slopes	975	0.1
VaD	Valentine loamy fine sand, 9 to 18 percent slopes	620	0.1
Vt	Vetal fine sandy loam	885	0.1
Wd	Wendte silty clay	960	0.1
We	Wendte silty clay, channeled	9,110	1.4
Wh	Whitelake fine sandy loam	620	0.1
Wn	Witten silty clay	2,525	0.4
	Water areas less than 40 acres in size	800	0.1
	Fort Randall Dam	90	*
	Total land area	653,205	100.0
	Open water areas more than 40 acres in size	22,680	
	Total area	675,885	

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
AaA	Agar silt loam, 0 to 3 percent slopes (where irrigated)
AaB	Agar silt loam, 3 to 6 percent slopes (where irrigated)
AhB	Anselmo-Holt fine sandy loams, 2 to 6 percent slopes (where irrigated)
Bb	Bon silt loam
BmB	Boro-Millboro silty clays, 2 to 6 percent slopes (where irrigated)
Ha	Haynie Variant-Munjor complex (where irrigated)
JaA	Jansen loam, 0 to 3 percent slopes (where irrigated)
JaB	Jansen loam, 3 to 6 percent slopes (where irrigated)
JbA	Jansen-Brocksburg loams, 0 to 2 percent slopes (where irrigated)
MoA	Millboro silty clay, 0 to 2 percent slopes (where irrigated)
MoB	Millboro silty clay, 2 to 6 percent slopes (where irrigated)
MpB	Millboro-Lakoma silty clays, 2 to 6 percent slopes (where irrigated)
On	Onita silt loam
Ot	Onita silt loam, occasionally flooded
RaA	Ree loam, 0 to 3 percent slopes (where irrigated)
RaB	Ree loam, 3 to 6 percent slopes (where irrigated)
RbA	Ree loam, gravelly substratum, 0 to 2 percent slopes (where irrigated)
ReA	Reliance silty clay loam, 0 to 3 percent slopes (where irrigated)
ReB	Reliance silty clay loam, 3 to 6 percent slopes (where irrigated)
UlA	Uly silt loam, 0 to 2 percent slopes (where irrigated)
UlB	Uly silt loam, 2 to 6 percent slopes (where irrigated)
Vt	Vetal fine sandy loam (where irrigated)
Wd	Wendte silty clay (where irrigated)
Wn	Witten silty clay (where irrigated)

TABLE 6.--LAND CAPABILITY UNIT AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability unit	Corn	Oats	Grain sorghum	Winter wheat	Cool-season grass	Alfalfa hay
		Bu	Bu	Bu	Bu	AUM*	Tons
AaA--- Agar	IIc-2	48	60	54	38	3.5	2.1
AaB--- Agar	IIe-1	46	56	51	36	3.3	2.0
AdC---		28	34	33	---	2.7	1.6
Anselmo---	IVe-8						
Dunday---	VIe-7						
AhB--- Anselmo-Holt	IIIe-8	36	38	40	---	3.0	1.8
AhC--- Anselmo-Holt	IVe-8	33	33	34	---	2.8	1.7
AtE---		---	---	---	---	---	---
Anselmo---	VIe-6						
Tassel---	VIe-10						
BaE--- Betts	VIIe-3	---	---	---	---	---	---
Bb--- Bon	IIc-3	60	67	67	42	4.8	2.9
Bc--- Bon	VIw-1	---	---	---	---	4.8	2.9
BlD--- Boro-Lakoma	VIe-4	---	---	---	---	1.6	1.0
BmB--- Boro-Millboro	IIIe-4	31	44	41	33	2.7	1.6
BmC--- Boro-Millboro	IVe-4	25	39	35	26	2.3	1.4
CaA---		12	24	20	---	---	---
Carter---	IVs-2						
Hurley---	VIs-1						
CbA---		25	44	41	27	2.2	1.3
Carter---	IVs-2						
Promise---	IIIs-3						
Cd--- Cass	VIw-1	---	---	---	---	---	---
CrC--- Coly	IVe-3	18	33	25	---	2.3	1.4
CrE--- Coly	VIe-3	---	---	---	---	---	---
DaA--- Dunday	IVe-9	30	36	30	---	2.5	1.5
Du--- Durrstein	VIw-3	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY UNIT AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability unit	Corn	Oats	Grain sorghum	Winter wheat	Cool-season grass	Alfalfa hay
		Bu	Bu	Bu	Bu	AUM*	Tons
Fd---------- Fedora	IVw-2	35	42	40	---	4.2	2.5
Ha---------- Haynie Variant	IIe-1	50	52	53	---	4.0	2.4
Munjor---------	IIIe-7						
HoA---------- Holt	IIIe-9	40	44	45	27	2.8	1.7
HoB---------- Holt	IIIe-10	38	42	42	25	2.7	1.6
HoC---------- Holt	IVe-8	32	36	36	21	2.2	1.3
HoD---------- Holt	VIe-6	---	---	---	---	1.6	1.0
Ia---------- Inavale	IVe-9	25	---	30	---	2.7	1.6
JaA---------- Jansen	IIIs-2	35	40	42	26	2.7	1.6
JaB---------- Jansen	IIIe-6	33	37	39	23	2.3	1.4
JaC---------- Jansen	IVe-5	25	30	31	19	1.8	1.1
JbA----------		38	43	45	28	2.8	1.7
Jansen---------	IIIs-2						
Brocksburg-----	IIs-2						
Ko---------- Kolls	Vw-4	---	---	---	---	---	---
LaB---------- Labu	IIIe-4	28	40	40	30	2.5	1.5
LaC---------- Labu	IVe-4	24	37	38	24	2.2	1.3
LaD---------- Labu	VIe-4	---	---	---	---	1.6	1.0
LcF---------- Labu-Sansarc	VIIe-8	---	---	---	---	---	---
LoD---------- Lakoma-Okaton	VIe-4	---	---	---	---	1.6	1.0
LwB----------		28	40	36	29	2.3	1.4
Lakoma---------	IIIe-4						
Wewela---------	IIIe-10						
LwC----------		23	37	30	23	2.0	1.2
Lakoma---------	IVe-4						
Wewela---------	IVe-8						
MaD---------- Mariaville	VIe-1	---	---	---	---	---	---
MaF---------- Mariaville	VIIe-1	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY UNIT AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability unit	Corn	Oats	Grain sorghum	Winter wheat	Cool-season grass	Alfalfa hay
		Bu	Bu	Bu	Bu	AUM*	Tons
MdF--Mariaville-Labu-Anselmo	VIIe-1	---	---	---	---	---	---
MeC, MeE--Meadin	VIs-4	---	---	---	---	---	---
MoA--Millboro	IIIs-3	38	52	51	40	3.3	2.0
MoB--Millboro	IIIe-4	36	50	48	37	3.2	1.9
MoC--Millboro	IVe-4	31	43	39	32	2.7	1.6
MpB--Millboro-Lakoma	IIIe-4	32	46	42	33	2.7	1.6
MpC--Millboro-Lakoma	IVe-4	25	38	34	28	2.3	1.4
Mr--Mosher	IVs-2	17	32	24	22	2.0	1.2
Ms--Mosher---Jerauld---	IVs-2 VIs-1	14	26	20	17	1.6	1.0
ObE--Okaton-Lakoma	VIIe-8	---	---	---	---	---	---
OcF--Okaton-Mariaville	VIIs-6	---	---	---	---	---	---
OeC--O'Neill	VIe-5	---	---	---	---	1.6	1.0
On--Onita	IIc-2	50	63	63	40	4.3	2.6
Ot--Onita	IIc-3	60	63	66	42	4.7	2.8
Pg**--Pits, gravel	VIIIs-2	---	---	---	---	---	---
Pm--Platte	IVw-2	---	---	---	---	---	---
PrA--Promise	IIIs-3	33	52	50	38	3.0	1.8
PrB--Promise	IIIe-4	31	50	48	36	2.7	1.6
PrC--Promise	IVe-4	26	42	40	32	2.2	1.3
RaA--Ree	IIc-2	47	57	56	35	3.5	2.1
RaB--Ree	IIe-1	45	55	54	33	3.3	2.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY UNITS AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability unit	Corn	Oats	Grain sorghum	Winter wheat	Cool-season grass	Alfalfa hay
		Bu	Bu	Bu	Bu	AUM*	Tons
RaC---------- Ree	IIIe-1	39	50	43	30	2.7	1.6
RbA---------- Ree	IIc-2	47	55	57	36	3.3	2.0
RcC---------- Ree---------- Tassel---------	IIIe-2 VIe-10	29	36	32	24	2.3	1.4
ReA---------- Reliance	IIc-2	49	58	57	39	3.7	2.2
ReB---------- Reliance	IIe-1	47	56	55	37	3.5	2.1
ReB2---------- Reliance	IIIe-2	40	43	49	34	3.3	2.0
ReC---------- Reliance	IIIe-1	40	43	49	34	3.3	2.0
ReC2---------- Reliance	IVe-1	35	38	37	27	2.7	1.6
ReD---------- Reliance	IVe-1	33	35	33	21	2.7	1.6
ReD2---------- Reliance	VIe-3	---	---	---	---	2.0	1.2
Rv**---------- Riverwash	VIIIe-1	---	---	---	---	---	---
ScE---------- Sansarc--------- Rock outcrop---	VIIe-8 VIIIs-2	---	---	---	---	---	---
So---------- Scott	IVw-1	---	---	---	---	3.3	2.0
TrE---------- Tassel--------- Rock outcrop---	VIe-10 VIIIs-1	---	---	---	---	---	---
UlA---------- Uly	IIc-2	48	55	52	---	3.5	2.1
UlB---------- UlY	IIe-1	45	53	50	---	3.3	2.0
VaC---------- Valentine	VIe-7	---	---	---	---	1.0	0.6
VaD---------- Valentine	VIe-7	---	---	---	---	---	---
Vt---------- Vetal	IIIe-7	55	60	60	---	4.2	2.5
Wd---------- Wendte	IIIs-3	35	55	49	35	3.7	2.2
We---------- Wendte	VIw-1	---	---	---	---	3.7	2.2

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY UNITS AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability unit	Corn	Oats	Grain sorghum	Winter wheat	Cool-season grass	Alfalfa hay
		Bu	Bu	Bu	Bu	AUM*	Tons
Wh---------- Whitelake	IVe-13	24	33	28	---	2.3	1.4
Wn---------- Witten	IIIs-3	42	60	60	45	3.7	2.2

* Animal-unit-month: The amount of forage or feed required to fed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
AaA, AaB---- Agar	Silty----	3,300	2,800	2,000
AdC*:				
Anselmo----	Sandy----	3,300	2,800	2,000
Dunday----	Sands----	3,000	2,500	1,700
AhB*, AhC*:				
Anselmo----	Sandy----	3,300	2,800	2,000
Holt----	Sandy----	3,100	2,600	1,800
AtE*:				
Anselmo----	Sandy----	3,100	2,600	1,800
Tassel----	Shallow----	2,300	1,900	1,300
BaE---- Betts	Thin Upland----	2,500	2,100	1,500
Bb---- Bon	Overflow----	4,200	3,800	3,000
Bc---- Bon	Overflow----	4,600	4,200	3,400
BlD*:				
Boro----	Clayey----	2,800	2,300	1,600
Lakoma----	Clayey----	3,200	2,700	1,900
BmB*, BmC*:				
Boro----	Clayey----	2,800	2,300	1,600
Millboro----	Clayey----	3,200	2,700	1,900
CaA*:				
Carter----	Claypan----	2,500	2,100	1,500
Hurley----	Thin Claypan----	1,700	1,400	900
CbA*:				
Carter----	Claypan----	2,500	2,100	1,500
Promise----	Clayey----	3,300	2,800	2,000
Cd---- Cass	Overflow----	4,500	3,700	2,500
CrC, CrE---- Coly	Thin Upland----	3,000	2,300	1,500
DaA---- Dunday	Sands----	3,000	2,500	1,700
Du---- Durrstein	Saline Lowland----	3,300	3,000	2,400
Fd---- Fedora	Subirrigated----	5,500	5,000	4,000
Ha*:				
Haynie Variant----	Silty----	3,700	3,100	2,200

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Ha*:				
Munjor	Sandy	3,400	2,800	2,000
HoA, HoB, HoC---- Holt	Sandy	3,200	2,700	1,900
HoD---- Holt	Sandy	2,900	2,400	1,700
Ia---- Inavale	Sands	3,800	3,000	2,200
JaA, JaB, JaC---- Jansen	Silty	3,500	2,500	1,500
JbA*:				
Jansen	Silty	3,000	2,500	1,700
Brocksburg	Silty	3,500	2,900	2,000
Ko---- Kolls	Closed Depression	3,700	3,400	2,400
LaB, LaC, LaD---- Labu	Clayey	3,000	2,500	1,800
LcF*:				
Labu	Clayey	2,800	2,300	1,600
Sansarc	Shallow Clay	2,300	1,900	1,300
LoD*:				
Lakoma	Clayey	3,200	2,700	1,900
Okaton	Shallow	2,800	2,300	1,600
LwB*, LwC*:				
Lakoma	Clayey	3,200	2,700	1,900
Wewela	Sandy	3,300	2,800	2,000
MaD, MaF---- Mariaville	Shallow	2,800	2,200	1,500
MdF*:				
Mariaville	Shallow	2,800	2,200	1,500
Labu	Clayey	2,800	2,300	1,600
Anselmo	Sandy	3,000	2,500	1,800
MeC, MeE---- Meadin	Shallow to Gravel	1,800	1,500	700
MoA, MoB, MoC---- Millboro	Clayey	3,200	2,700	1,900
MpB*, MpC*:				
Millboro	Clayey	3,200	2,700	1,900
Lakoma	Clayey	3,200	2,700	1,900
Mr---- Mosher	Claypan	2,500	2,100	1,500
Ms*:				
Mosher	Claypan	2,500	2,100	1,500
Jerauld	Thin Claypan	1,700	1,400	1,000

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ObE*:				
Okaton	Shallow	2,500	2,100	1,500
Lakoma	Clayey	3,000	2,500	1,800
OcF*:				
Okaton	Shallow	1,900	1,600	1,100
Mariaville	Shallow	2,800	2,200	1,500
OeC O'Neill	Sandy	2,800	2,300	1,600
On Onita	Silty	3,700	3,400	2,400
Ot Onita	Overflow	4,500	3,800	2,700
Pm Platte	Subirrigated	5,500	5,000	4,000
PrA, PrB, PrC Promise	Clayey	3,300	2,800	2,000
RaA, RaB, RaC, RbA Ree	Silty	3,500	2,900	2,000
RcC*:				
Ree	Silty	3,500	2,900	2,000
Tassel	Shallow	2,300	1,900	1,300
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2 Reliance	Silty	3,500	2,900	2,000
ScE*:				
Sansarc	Shallow Clay	2,300	1,900	1,300
Rock outcrop.				
So Scott	Closed Depression	4,300	3,600	2,500
TrE*:				
Tassel	Shallow	2,300	1,900	1,300
Rock outcrop.				
UlA, UlB Uly	Silty	3,400	2,800	2,000
VaC, VaD Valentine	Sands	3,000	2,500	1,700
Vt Vetal	Sandy	3,600	3,000	2,100
Wd Wendte	Clayey Overflow	4,000	3,300	2,400
We Wendte	Clayey Overflow	4,000	3,300	2,400

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Wh---------- Whitelake	Sandy----------	3,200	2,700	1,900
Wn---------- Witten	Clayey----------	3,700	3,100	2,200

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
AaA, AaB---------- Agar	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm------	---
AdC*: Anselmo----------	Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Russian-olive, Manchurian crabapple, Siberian peashrub.	Honeylocust, hackberry, ponderosa pine, green ash.	Siberian elm------	---
Dunday----------	---	Eastern redcedar, Rocky Mountain juniper.	Austrian pine, ponderosa pine, jack pine.	---	---
AhB*, AhC*: Anselmo----------	Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Russian-olive, Manchurian crabapple, Siberian peashrub.	Honeylocust, hackberry, ponderosa pine, green ash.	Siberian elm------	---
Holt----------	Lilac, Peking cotoneaster.	Eastern redcedar, Rocky Mountain juniper, Manchurian crabapple, Siberian peashrub.	Honeylocust, green ash, bur oak, ponderosa pine, Russian-olive.	Siberian elm------	---
AtE*: Anselmo----------	Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Russian-olive, Manchurian crabapple, Siberian peashrub.	Honeylocust, hackberry, ponderosa pine, green ash.	Siberian elm------	---
Tassel.					
BaE. Betts					
Bb---------- Bon	Lilac----------	Siberian peashrub, American plum, Tatarian honeysuckle.	Hackberry, green ash, blue spruce, ponderosa pine, Russian mulberry, eastern redcedar.	Honeylocust-------	Eastern cottonwood.
Bc. Bon					
BlD*: Boro----------	Siberian peashrub, Tatarian honeysuckle, lilac, skunkbush sumac.	Hackberry, eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple.	Siberian elm, honeylocust, green ash.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
BlD*: Lakoma	Siberian peashrub, silver buffaloberry, lilac, skunkbush sumac.	Ponderosa pine, hackberry, Russian-olive, eastern redcedar, Rocky Mountain juniper.	Siberian elm, honeylocust, green ash.	---	---
BmB*, BmC*: Boro	Siberian peashrub, Tatarian honeysuckle, lilac, skunkbush sumac.	Hackberry, eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple.	Siberian elm, honeylocust, green ash.	---	---
Millboro	Siberian peashrub, Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple, hackberry.	Siberian elm, honeylocust, green ash.	---	---
CaA*: Carter	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac, Tatarian honeysuckle.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Hurley.					
CbA*: Carter	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac, Tatarian honeysuckle.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Promise	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac.	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, honeylocust, Siberian elm.	---	---
Cd Cass	---	Peking cotoneaster, Tatarian honeysuckle, lilac, American plum.	Eastern redcedar, Rocky Mountain juniper.	Austrian pine, hackberry, honeylocust, bur oak, green ash.	Eastern cottonwood.
CrC Coly	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian-olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
CrE. Coly					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
DaA---------- Dunday	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
Du. Durrstein					
Fd---------- Fedora	Lilac----------	Siberian peashrub, American plum, Tatarian honeysuckle.	Hackberry, green ash, blue spruce, ponderosa pine, Russian mulberry, eastern redcedar.	Honeylocust-------	Eastern cottonwood.
Ha*: Haynie Variant---	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm------	---
Munjor----------	---	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry.	Ponderosa pine, Russian-olive, green ash, Russian mulberry, eastern redcedar.	Siberian elm, hackberry, honeylocust.	Eastern cottonwood.
HoA, HoB, HoC, HoD---------- Holt	Lilac, Peking cotoneaster.	Eastern redcedar, Rocky Mountain juniper, Manchurian crabapple, Siberian peashrub.	Honeylocust, green ash, bur oak, ponderosa pine, Russian-olive.	Siberian elm------	---
Ia---------- Inavale	---	Eastern redcedar, Rocky Mountain juniper.	Austrian pine, Ponderosa pine, jack pine.	---	---
JaA, JaB, JaC----- Jansen	Siberian peashrub, Peking cotoneaster, lilac.	Eastern redcedar, Russian-olive, ponderosa pine, Manchurian crabapple, Rocky Mountain juniper, bur oak.	Green ash, Siberian elm, honeylocust.	---	---
JbA*: Jansen----------	Siberian peashrub, Peking cotoneaster, lilac.	Eastern redcedar, Russian-olive, ponderosa pine, Manchurian crabapple, Rocky Mountain juniper, bur oak.	Green ash, Siberian elm, honeylocust.	---	---
Brocksburg-------	Siberian peashrub, lilac, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple, ponderosa pine, bur oak, Russian-olive, Rocky Mountain juniper.	Siberian elm, honeylocust, green ash.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ko. Kolls					
LaB, LaC, LaD----- Labu	Siberian peashrub, lilac, skunkbush sumac, Tatarian honeysuckle.	Rocky Mountain juniper, Russian-olive, eastern redcedar, Manchurian crabapple, hackberry.	Green ash, honeylocust, Siberian elm.	---	---
LcF*: Labu.					
Sansarc.					
LoD*: Lakoma.					
Okaton.					
LwB*, LwC*: Lakoma----------	Siberian peashrub, silver buffaloberry, lilac, skunkbush sumac.	Ponderosa pine, hackberry, Russian-olive, eastern redcedar, Rocky Mountain juniper.	Siberian elm, honeylocust, green ash.	---	---
Wewela----------	Skunkbush sumac, lilac.	Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper, Tatarian honeysuckle, Siberian peashrub.	Green ash, hackberry, honeylocust.	Siberian elm------	---
MaD, MaF. Mariaville					
MdF*: Mariaville.					
Labu.					
Anselmo.					
MeC, MeE. Meadin					
MoA, MoB, MoC----- Millboro	Siberian peashrub, Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple, hackberry.	Siberian elm, honeylocust, green ash.	---	---
MpB*, MpC*: Millboro---------	Siberian peashrub, Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple, hackberry.	Siberian elm, honeylocust, green ash.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
MpB*, MpC*: Lakoma	Siberian peashrub, silver buffaloberry, lilac, skunkbush sumac.	Ponderosa pine, hackberry, Russian-olive, eastern redcedar, Rocky Mountain juniper.	Siberian elm, honeylocust, green ash.	---	---
Mr Mosher	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine, green ash, Russian-olive.	---	---	---
Ms*: Mosher	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine, green ash, Russian-olive.	---	---	---
Jerauld.					
ObE*: Okaton.					
Lakoma.					
OcF*: Okaton.					
Mariaville.					
OeC O'Neill	Siberian peashrub, lilac, Peking cotoneaster.	Eastern redcedar, ponderosa pine, Rocky Mountain juniper, Russian-olive, Manchurian crabapple, bur oak.	Siberian elm, honeylocust, green ash.	---	---
On Onita	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm	---
Ot Onita	Lilac	Tatarian honeysuckle, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, green ash, hackberry, Russian mulberry, eastern redcedar.	Honeylocust	Eastern cottonwood.
Pg*. Pits, gravel					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pm---------- Platte	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian-olive, eastern redcedar.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
PrA, PrB, PrC----- Promise	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac.	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, honeylocust, Siberian elm.	---	---
RaA, RaB, RaC----- Ree	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm------	---
RbA---------- Ree	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, bur oak, honeylocust.	Siberian elm------	---
RcC*: Ree----------	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm------	---
Tassel.					
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2---------- Reliance	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm------	---
Rv*. Riverwash					
ScE*: Sansarc.					
Rock outcrop.					
So. Scott					
TrE*: Tassel.					
Rock outcrop.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
U1A, U1B---------- Uly	Tatarian honeysuckle, lilac.	Common chokecherry, Siberian peashrub, eastern redcedar.	Hackberry, bur oak, Russian-olive, green ash, honeylocust, ponderosa pine.	Siberian elm------	---
VaC, VaD---------- Valentine	---	Eastern redcedar, Austrian pine, Rocky Mountain juniper, jack pine.	Ponderosa pine----	---	---
Vt---------- Vetal	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Ponderosa pine, blue spruce, green ash, hackberry, Russian mulberry, eastern redcedar.	Honeylocust-------	Eastern cottonwood.
Wd, We---------- Wendte	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac.	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, Siberian elm, honeylocust.	---	---
Wh---------- Whitelake	Tatarian honeysuckle, lilac, skunkbush sumac.	Manchurian crabapple, Russian-olive, eastern redcedar, Siberian peashrub.	Green ash, hackberry, ponderosa pine, honeylocust.	Siberian elm------	---
Wn---------- Witten	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac.	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, Siberian elm, honeylocust.	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
AaA--- Agar	Slight	Slight	Slight	Slight.
AaB--- Agar	Slight	Slight	Moderate: slope.	Slight.
AdC*:				
Anselmo	Slight	Slight	Severe: slope.	Slight.
Dunday	Slight	Slight	Severe: slope.	Slight.
AhB*, AhC*:				
Anselmo	Slight	Slight	Moderate: slope.	Slight.
Holt	Slight	Slight	Moderate: slope, depth to rock.	Slight.
AtE*:				
Anselmo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
BaE--- Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bb--- Bon	Severe: flooding.	Slight	Slight	Slight.
Bc--- Bon	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
BlD*:				
Boro	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Severe: erodes easily.
Lakoma	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Severe: erodes easily.
BmB*, BmC*:				
Boro	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Millboro	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
CaA*:				
Carter	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Hurley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
CbA*:				
Carter	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Cd Cass	Severe: flooding.	Slight	Moderate: flooding.	Slight.
CrC Coly	Slight	Slight	Severe: slope.	Slight.
CrE Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
DaA Dunday	Slight	Slight	Slight	Slight.
Du Durrstein	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, excess salt.	Severe: wetness, excess sodium, excess salt.	Severe: wetness.
Fd Fedora	Severe: wetness, flooding.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Ha*:				
Haynie Variant	Slight	Slight	Slight	Slight.
Munjor	Slight	Slight	Slight	Slight.
HoA Holt	Slight	Slight	Slight	Slight.
HoB Holt	Slight	Slight	Moderate: slope, depth to rock.	Slight.
HoC Holt	Slight	Slight	Severe: slope.	Slight.
HoD Holt	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Ia Inavale	Severe: flooding.	Slight	Slight	Slight.
JaA Jansen	Slight	Slight	Slight	Slight.
JaB Jansen	Slight	Slight	Moderate: slope.	Slight.
JaC Jansen	Slight	Slight	Severe: slope.	Slight.
JbA*:				
Jansen	Slight	Slight	Slight	Slight.
Brocksburg	Slight	Slight	Slight	Slight.
Ko Kolls	Severe: ponding, percs slowly, too clayey.	Severe: too clayey, ponding, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: too clayey, ponding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
LaB---------- Labu	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey, depth to rock.	Moderate: too clayey.
LaC---------- Labu	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
LaD---------- Labu	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
LcF*: Labu----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.
Sansarc----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
LoD*: Lakoma----------	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Severe: erodes easily.
Okaton----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
LwB*: Lakoma----------	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope, depth to rock.	Moderate: too clayey.
Wewela----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight.
LwC*: Lakoma----------	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Wewela----------	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.
MaD---------- Mariaville	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
MaF---------- Mariaville	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
MdF*: Mariaville----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Labu----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Anselmo----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
MeC---------- Meadin	Slight----------	Slight----------	Severe: slope.	Slight.
MeE---------- Meadin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
MoA---------- Millboro	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
MoB---------- Millboro	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
MoC---------- Millboro	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
MpB*: Millboro----------	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Lakoma----------	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope, depth to rock.	Moderate: too clayey.
MpC*: Millboro----------	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Lakoma----------	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Mr---------- Mosher	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Ms*: Mosher----------	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Jerauld----------	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
ObE*: Okaton----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Lakoma----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
OcF*: Okaton----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope, erodes easily.
Mariaville----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
OeC---------- O'Neill	Slight----------	Slight----------	Severe: slope.	Slight.
On---------- Onita	Slight----------	Slight----------	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ot---------- Onita	Severe: flooding.	Slight----------	Moderate: flooding.	Slight.
Pg*. Pits, gravel				
Pm---------- Platte	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
PrA---------- Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
PrB---------- Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly, slope.	Moderate: too clayey.
PrC---------- Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.
RaA---------- Ree	Slight----------	Slight----------	Slight----------	Slight.
RaB---------- Ree	Slight----------	Slight----------	Moderate: slope.	Slight.
RaC---------- Ree	Slight----------	Slight----------	Severe: slope.	Slight.
RbA---------- Ree	Slight----------	Slight----------	Slight----------	Slight.
RcC*: Ree----------	Slight----------	Slight----------	Severe: slope.	Slight.
Tassel----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
ReA, ReB---------- Reliance	Slight----------	Slight----------	Slight----------	Slight.
ReB2---------- Reliance	Slight----------	Slight----------	Moderate: slope.	Slight.
ReC, ReC2---------- Reliance	Slight----------	Slight----------	Severe: slope.	Slight.
ReD, ReD2---------- Reliance	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rv*. Riverwash				
ScE*: Sansarc----------	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Rock outcrop.				
So---------- Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
TrE*: Tassel---------- Rock outcrop.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
U1A, U1B---------- Uly	Slight----------	Slight----------	Slight----------	Slight.
VaC---------- Valentine	Slight----------	Slight----------	Severe: slope.	Slight.
VaD---------- Valentine	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Vt---------- Vetal	Severe: flooding.	Slight----------	Moderate: flooding.	Slight.
Wd---------- Wendte	Severe: flooding.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.
We---------- Wendte	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding, too clayey.	Moderate: too clayey, flooding.
Wh---------- Whitelake	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Wn---------- Witten	Severe: flooding.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
AaA---------- Agar	Slight----------	Slight----------	Slight----------	Slight----------	Severe: low strength.
AaB---------- Agar	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.
AdC*: Anselmo----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Moderate: frost action.
Dunday----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
AhB*, AhC*: Anselmo----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Moderate: frost action.
Holt----------	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.
AtE*: Anselmo----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tassel----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
BaE---------- Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Bb---------- Bon	Slight----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Bc---------- Bon	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.
BlD*: Boro----------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Lakoma----------	Moderate: too clayey, slope, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
BmB*, BmC*: Boro----------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Millboro---------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
CaA*:					
Carter	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Hurley	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
CbA*:					
Carter	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Promise	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cd Cass	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
CrC Coly	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
CrE Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DaA Dunday	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Du Durrstein	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, wetness.
Fd Fedora	Severe: wetness, cutbanks cave.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: frost action.
Ha*:					
Haynie Variant	Slight	Slight	Slight	Slight	Severe: low strength.
Munjor	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
HoA Holt	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: frost action.
HoB, HoC Holt	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.
HoD Holt	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.
Ia Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
JaA Jansen	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
JaB, JaC Jansen	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
JbA*:					
Jansen	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
Brocksburg	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
Ko Kolls	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: low strength, ponding, shrink-swell.
LaB, LaC Labu	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
LaD Labu	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
LcF*:					
Labu	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Sansarc	Severe: slope, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
LoD*:					
Lakoma	Moderate: too clayey, slope, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
Okaton	Severe: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
LwB*, LwC*:					
Lakoma	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Wewela	Moderate: depth to rock, too clayey.	Slight	Severe: shrink-swell.	Moderate: slope.	Severe: low strength.
MaD Mariaville	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.
MaF Mariaville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
MdF*:					
Mariaville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
Labu	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
MdF*: Anselmo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MeC: Meadin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
MeE: Meadin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoA, MoB, MoC: Millboro	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
MpB*, MpC*: Millboro	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Lakoma	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Mr: Mosher	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Ms*: Mosher	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Jerauld	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
ObE*: Okaton	Severe: slope, depth to rock.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.
Lakoma	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
OcF*: Okaton	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
Mariaville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
OeC: O'Neill	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
On: Onita	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ot---------- Onita	Moderate: too clayey, wetness, flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.
Pg*. Pits, gravel					
Pm---------- Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.
PrA, PrB, PrC----- Promise	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
RaA---------- Ree	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
RaB, RaC---------- Ree	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
RbA---------- Ree	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action, shrink-swell.
RcC*: Ree----------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Tassel----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
ReA, ReB, ReB2, ReC, ReC2-------- Reliance	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
ReD, ReD2--------- Reliance	Moderate: too clayey, slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Rv*. Riverwash					
ScE*: Sansarc----------	Severe: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
Rock outcrop.					
So---------- Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.
TrE*: Tassel----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
UlA, UlB---------- Uly	Slight----------	Slight----------	Slight----------	Slight----------	Severe: low strength.
VaC---------- Valentine	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
VaD---------- Valentine	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Vt---------- Vetal	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Wd---------- Wendte	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
We---------- Wendte	Moderate: flooding, too clayey.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, low strength, flooding.
Wh---------- Whitelake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.
Wn---------- Witten	Moderate: flooding, too clayey.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding, low strength.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AaA---------- Agar	Slight----------	Moderate: seepage.	Slight----------	Slight----------	Good.
AaB---------- Agar	Slight----------	Moderate: slope, seepage.	Slight----------	Slight----------	Good.
AdC*: Anselmo----------	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: seepage, too sandy.
Dunday----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
AhB*, AhC*: Anselmo----------	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: seepage, too sandy.
Holt----------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
AtE*: Anselmo----------	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Tassel----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
BaE---------- Betts	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Bb---------- Bon	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Good.
Bc---------- Bon	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding.	Good.
BlD*: Boro----------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Lakoma----------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
BmB*: Boro----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BmB*:					
Millboro	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BmC*:					
Boro	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Millboro	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CaA*:					
Carter	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Hurley	Severe: percs slowly.	Slight	Severe: excess sodium, too clayey.	Slight	Poor: hard to pack, excess sodium.
CbA*:					
Carter	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Promise	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Cd Cass	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: thin layer.
CrC Coly	Slight	Severe: slope.	Slight	Slight	Good.
CrE Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
DaA Dunday	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Du Durrstein	Severe: flooding, percs slowly, wetness.	Slight	Severe: flooding, too clayey, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Fd Fedora	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Ha*:					
Haynie Variant	Slight	Moderate: seepage.	Slight	Slight	Good.
Munjor	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
HoA, HoB Holt	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HoC, HoD---------- Holt	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Ia---------- Inavale	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy, flooding.	Severe: seepage, flooding.	Poor: too sandy, seepage.
JaA, JaB---------- Jansen	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
JaC---------- Jansen	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
JbA*: Jansen----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Brocksburg---------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ko---------- Kolls	Severe: percs slowly, ponding.	Slight----------	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
LaB---------- Labu	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
LaC, LaD---------- Labu	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
LcF*: Labu----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Sansarc----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, hard to pack.
LoD*: Lakoma----------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
Okaton----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: hard to pack, area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LwB*:					
Lakoma	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
Wewela	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
LwC*:					
Lakoma	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
Wewela	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
MaD Mariaville	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
MaF Mariaville	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
MdF*:					
Mariaville	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Labu	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Anselmo	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
MeC Meadin	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
MeE Meadin	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
MoA Millboro	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MoB Millboro	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MoC Millboro	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MpB*:					
Millboro	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MpB*: Lakoma	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
MpC*: Millboro	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MpC*: Lakoma	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: hard to pack, area reclaim.
Mr Mosher	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Ms*: Mosher	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
ObE*: Okaton	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: hard to pack, area reclaim, slope.
Lakoma	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: slope, hard to pack, area reclaim.
OcF*: Okaton	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, hard to pack, slope.
Mariaville	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
OeC O'Neill	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
On Onita	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Ot Onita	Severe: flooding, wetness, percs slowly.	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Pg*. Pits, gravel					
Pm Platte	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PrA---------- Promise	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
PrB---------- Promise	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
PrC---------- Promise	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
RaA, RaB---------- Ree	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Poor: thin layer.
RaC---------- Ree	Moderate: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Slight----------	Poor: thin layer.
RbA---------- Ree	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
RcC*:					
Ree----------	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Poor: thin layer.
Tassel----------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
ReA---------- Reliance	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight----------	Fair: too clayey.
ReB, ReB2---------- Reliance	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
ReC, ReC2---------- Reliance	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
ReD, ReD2---------- Reliance	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Rv*. Riverwash					
ScE*:					
Sansarc----------	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
Rock outcrop.					
So---------- Scott	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
TrE*:					
Tassel----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
UlA---------- Uly	Slight----------	Moderate: seepage.	Slight----------	Slight----------	Good.
UlB---------- Uly	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
VaC---------- Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaD---------- Valentine	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Vt---------- Vetal	Severe: flooding.	Severe: seepage.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
Wd---------- Wendte	Severe: percs slowly.	Slight----------	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
We---------- Wendte	Severe: percs slowly, flooding.	Severe: flooding.	Severe: too clayey, flooding.	Severe: flooding.	Poor: too clayey, hard to pack.
Wh---------- Whitelake	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: seepage, too sandy, excess sodium.	Severe: seepage.	Poor: too sandy, excess sodium.
Wn---------- Witten	Severe: percs slowly, flooding.	Slight----------	Severe: too clayey, flooding.	Severe: flooding.	Poor: too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AaA, AaB---------- Agar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AdC*: Anselmo----------	Fair: area reclaim, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: thin layer.
Dunday----------	Good----------	Probable----------	Improbable: too sandy.	Poor: thin layer.
AhB*, AhC*: Anselmo----------	Fair: area reclaim, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: thin layer.
Holt----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
AtE*: Anselmo----------	Fair: area reclaim, thin layer, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: slope.
Tassel----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
BaE---------- Betts	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Bb---------- Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bc---------- Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BlD*: Boro----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lakoma----------	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BmB*, BmC*: Boro----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Millboro----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CaA*:				
Carter	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hurley	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
CbA*:				
Carter	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Promise	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Cd Cass	Good	Probable	Improbable: too sandy.	Good.
CrC Coly	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CrE Coly	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
DaA Dunday	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Du Durrstein	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness, excess sodium.
Fd Fedora	Fair: wetness.	Probable	Probable	Fair: area reclaim, thin layer.
Ha*:				
Haynie Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Munjor	Good	Probable	Improbable: too sandy.	Good.
HoA, HoB, HoC, HoD Holt	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
Ia Inavale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
JaA, JaB, JaC Jansen	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
JbA*:				
Jansen	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Brocksburg	Good	Probable	Improbable: too sandy.	Poor: area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ko Kolls	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
LaB, LaC, LaD Labu	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LcF*: Labu	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Sansarc	Poor: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, area reclaim.
LoD*: Lakoma	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Okaton	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim.
LwB*, LwC*: Lakoma	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wewela	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MaD Mariaville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MaF Mariaville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
MdF*: Mariaville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Labu	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Anselmo	Fair: area reclaim, thin layer, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: slope.
MeC Meadin	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MeE---------- Meadin	Fair: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.
MoA, MoB, MoC---------- Millboro	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MpB*, MpC*: Millboro----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lakoma----------	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mr---------- Mosher	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Ms*: Mosher----------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Jerauld----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
ObE*: Okaton----------	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope, area reclaim.
Lakoma----------	Poor: low strength, area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
OcF*: Okaton----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, slope.
Mariaville----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
OeC---------- O'Neill	Good----------	Probable----------	Probable----------	Fair: small stones.
On, Ot---------- Onita	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pg*. Pits, gravel				
Pm---------- Platte	Fair: wetness.	Probable----------	Probable----------	Poor: area reclaim, small stones.
PrA, PrB, PrC---------- Promise	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RaA, RaB, RaC--------- Ree	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
RbA---------- Ree	Good----------	Probable----------	Probable----------	Fair: small stones, area reclaim.
RcC*: Ree----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Tassel----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2------ Reliance	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Rv*. Riverwash				
ScE*: Sansarc----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim.
Rock outcrop.				
So---------- Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
TrE*: Tassel----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
UlA, UlB---------- Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
VaC---------- Valentine	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
VaD---------- Valentine	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy, slope.
Vt---------- Vetal	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
Wd---------- Wendte	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
We---------- Wendte	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wh---------- Whitelake	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Wn---------- Witten	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AaA---------- Agar	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
AaB---------- Agar	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
AdC*: Anselmo----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
Dunday----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
AhB*, AhC*: Anselmo----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
Holt----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
AtE*: Anselmo----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Slope, too sandy, soil blowing.	Slope.
Tassel----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
BaE---------- Betts	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Bb---------- Bon	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Bc---------- Bon	Moderate: seepage.	Moderate: piping.	Flooding, frost action.	Flooding-------	Favorable------	Favorable.
BlD*: Boro----------	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
Lakoma----------	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, erodes easily.	Slope, droughty, erodes easily.
BmB*, BmC*: Boro----------	Moderate: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
Millboro---------	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
CaA*: Carter----------	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
CaA*: Hurley	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily.
CbA*: Carter	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Promise	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	Percs slowly, erodes easily.	Erodes easily, droughty.
Cd: Cass	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
CrC: Coly	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CrE: Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
DaA: Dunday	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Du: Durrstein	Slight	Severe: hard to pack, wetness, excess sodium.	Flooding, percs slowly, excess salt.	Wetness, droughty, percs slowly.	Wetness, percs slowly, erodes easily.	Excess sodium, excess salt, wetness.
Fd: Fedora	Severe: seepage.	Severe: piping, seepage.	Frost action	Wetness	Wetness	Wetness.
Ha*: Haynie Variant	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Munjor	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Soil blowing	Favorable.
HoA: Holt	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, depth to rock.	Depth to rock, soil blowing.	Depth to rock.
HoB, HoC: Holt	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
HoD: Holt	Severe: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Ia: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
JaA, JaB, JaC: Jansen	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Too sandy	Favorable.
JbA*: Jansen	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Too sandy	Favorable.
Brocksburg	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ko---------- Kolls	Slight---------	Severe: hard to pack, ponding.	Percs slowly, ponding.	Slow intake, ponding.	Ponding, erodes easily, percs slowly.	Wetness, er
LaB, LaC---------- Labu	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Depth to rock, percs slowly.	Droughty, depth to rock.
LaD---------- Labu	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
LcF*: Labu----------	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Sansarc----------	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, erodes easily.
LoD*: Lakoma----------	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, erodes easily.	Slope, droughty, erodes easily.
Okaton----------	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
LwB*, LwC*: Lakoma----------	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Depth to rock, erodes easily.	Droughty, erodes easily.
Wewela----------	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock.	Depth to rock, soil blowing.	Depth to rock, percs slowly.
MaD, MaF---------- Mariaville	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
MdF*: Mariaville-------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Labu----------	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Anselmo----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Slope, too sandy, soil blowing.	Slope.
MeC---------- Meadin	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy, soil blowing.	Droughty.
MeE---------- Meadin	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy, soil blowing.	Slope, droughty.
MoA---------- Millboro	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
MoB, MoC---------- Millboro	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MpB*, MpC*:						
Millboro	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
Lakoma	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Depth to rock, erodes easily.	Droughty, erodes easily.
Mr Mosher	Moderate: seepage.	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess sodium, percs slowly, erodes easily.
Ms*:						
Mosher	Moderate: seepage.	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess sodium, percs slowly, erodes easily.
Jerauld	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, droughty, erodes easily.
ObE*:						
Okaton	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lakoma	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, erodes easily.	Slope, droughty, erodes easily.
OcF*:						
Okaton	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Large stones, slope, erodes easily.
Mariaville	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
OeC O'Neill	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, soil blowing, rooting depth.	Too sandy, soil blowing.	Droughty, rooting depth.
On Onita	Slight	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
Ot Onita	Slight	Moderate: hard to pack.	Flooding, frost action.	Wetness, flooding.	Erodes easily	Erodes easily.
Pg*. Pits, gravel						
Pm Platte	Severe: seepage.	Severe: seepage, wetness, piping.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
PrA Promise	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	Percs slowly, erodes easily.	Erodes easily, droughty.
PrB, PrC Promise	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	Percs slowly, erodes easily.	Erodes easily, droughty.
RaA Ree	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
RaB, RaC---------- Ree	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope----------	Favorable------	Favorable.
RbA---------- Ree	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable------	Favorable------	Favorable.
RcC*: Ree----------	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope----------	Favorable------	Favorable.
Tassel----------	Severe: depth to rock.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
ReA---------- Reliance	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
ReB, ReB2, ReC, ReC2---------- Reliance	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
ReD, ReD2--------- Reliance	Severe: slope.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
Rv*. Riverwash						
ScE*: Sansarc----------	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, erodes easily.
Rock outcrop.						
So---------- Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Not needed-----	Not needed.
TrE*: Tassel----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
Rock outcrop.						
UlA---------- Uly	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
UlB---------- Uly	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
VaC---------- Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VaD---------- Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Vt---------- Vetal	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
Wd---------- Wendte	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly, slow intake.	Percs slowly---	Percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
We---------- Wendte	Slight---------	Severe: hard to pack.	Deep to water	Flooding, percs slowly, slow intake.	Percs slowly---	Percs slowly.
Wh---------- Whitelake	Severe: seepage.	Severe: piping, excess sodium.	Percs slowly, frost action.	Wetness, excess sodium.	Soil blowing, wetness, too sandy.	Percs slowly, excess sodium, droughty.
Wn---------- Witten	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly, erodes easily.	Percs slowly, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AaA, AaB---------- Agar	0-7	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	7-19	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	19-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
AdC*: Anselmo----------	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<20	NP-5
	8-23	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<24	NP-5
	23-48	Fine sandy loam, loamy fine sand, fine sand.	SM, SP-SM	A-4, A-2	0	100	100	65-100	12-45	<20	NP
	48-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Dunday----------	0-17	Loamy fine sand	SM, SM-SC	A-2	0	100	100	90-100	13-35	<25	NP-4
	17-60	Fine sand, loamy sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	50-95	5-35	<25	NP-4
AhB*, AhC*: Anselmo----------	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<20	NP-5
	8-23	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<24	NP-5
	23-48	Fine sandy loam, loamy fine sand, fine sand.	SM, SP-SM	A-4, A-2	0	100	100	65-100	12-45	<20	NP
	48-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Holt----------	0-5	Fine sandy loam	SM, SM-SC	A-4, A-2	0	100	95-100	90-100	25-45	15-30	NP-7
	5-23	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	25-45	20-35	NP-10
	23-30	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	25-45	20-35	NP-10
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
AtE*: Anselmo----------	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<20	NP-5
	8-23	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<24	NP-5
	23-48	Fine sandy loam, loamy fine sand, fine sand.	SM, SP-SM	A-4, A-2	0	100	100	65-100	12-45	<20	NP
	48-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Tassel----------	0-7	Fine sandy loam	ML, SM	A-4	0	95-100	90-100	75-100	40-65	<35	NP-7
	7-14	Fine sandy loam, loamy very fine sand, sandy loam.	ML, SM	A-4	0	95-100	90-100	65-95	40-65	<35	NP-7
	14-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BaE---------- Betts	0-5	Loam----------	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	75-100	60-75	20-38	5-15
	5-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Bb---------- Bon	0-27 27-60	Silt loam-------- Stratified silty clay loam to loamy fine sand.	CL-ML, CL ML, SM, SC, CL	A-4, A-6 A-4, A-6, A-7	0 0	100 95-100	95-100 95-100	80-95 75-95	55-85 45-95	25-40 25-45	5-15 3-22
Bc---------- Bon	0-27 27-60	Silt loam-------- Stratified silty clay loam to loamy fine sand.	CL-ML, CL ML, SM, CL, CL-ML	A-4, A-6 A-4, A-6, A-7	0 0	100 95-100	90-100 95-100	80-95 75-95	60-85 45-95	25-40 25-45	5-15 3-22
BlD*:											
Boro----------	0-5 5-60	Silty clay------- Clay, silty clay	CH, MH CH, MH	A-7 A-7	0 0	100 100	100 100	90-100 90-100	80-100 80-100	50-80 50-80	20-40 20-40
Lakoma----------	0-6 6-29 29-60	Silty clay------- Silty clay, clay, shaly clay. Weathered bedrock	CH, MH CH, MH ---	A-7 A-7 ---	0 0 ---	100 100 ---	95-100 95-100 ---	90-100 90-100 ---	85-100 85-100 ---	50-85 50-85 ---	20-50 20-50 ---
BmB*, BmC*:											
Boro----------	0-5 5-60	Silty clay------- Clay, silty clay	CH, MH CH, MH	A-7 A-7	0 0	100 100	100 100	90-100 90-100	80-100 80-100	50-80 50-80	20-40 20-40
Millboro--------	0-6 6-28 28-60	Silty clay------- Clay, silty clay Silty clay, clay	CL, CH CH, MH CH, MH	A-7 A-7 A-7	0 0 0	100 100 100	100 100 95-100	90-100 90-100 90-100	75-100 85-100 85-100	40-60 50-80 50-80	15-35 20-50 20-50
CaA*:											
Carter----------	0-6 6-23 23-60	Silty clay loam Clay, silty clay Clay, silty clay	CL CH, MH CH, MH	A-6, A-7 A-7 A-7	0 0 0	100 100 100	100 100 100	95-100 90-100 90-100	90-100 90-100 90-100	30-45 60-85 55-80	15-25 25-50 25-50
Hurley----------	0-4 4-60	Silt loam-------- Clay, shaly clay, silty clay.	CL, CL-ML CH, MH	A-4, A-6 A-7	0 0	100 100	100 100	95-100 95-100	90-100 80-100	25-40 50-90	5-15 20-55
CbA*:											
Carter----------	0-6 6-23 23-60	Silty clay loam Clay, silty clay Clay, silty clay	CL CH, MH CH, MH	A-6, A-7 A-7 A-7	0 0 0	100 100 100	100 100 100	95-100 90-100 90-100	90-100 90-100 90-100	30-45 60-85 55-80	15-25 25-50 25-50
Promise----------	0-10 10-31 31-60	Clay------------- Clay------------- Clay, silty clay	CH, MH CH, MH CH, MH	A-7 A-7 A-7	0 0 0	100 100 100	100 100 100	90-100 90-100 90-100	80-100 85-100 85-100	55-70 60-85 60-90	25-40 25-50 25-55
Cd---------- Cass	0-19 19-60	Fine sandy loam Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC SM, SM-SC	A-4, A-2 A-4, A-2	0 0	100 100	95-100 95-100	85-95 85-95	20-40 20-50	<20 <20	NP-5 NP-5
CrC, CrE---------- Coly	0-5 5-60	Silt loam-------- Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML ML, CL, CL-ML	A-4, A-6 A-4	0 0	100 100	100 100	85-100 85-100	85-100 85-100	20-40 20-35	2-15 2-10
DaA---------- Dunday	0-17 17-60	Loamy fine sand Fine sand, loamy sand, sand.	SM, SM-SC SM, SP-SM, SM-SC	A-2 A-2, A-3	0 0	100 100	100 100	90-100 50-95	13-35 5-35	<25 <25	NP-4 NP-4
Du---------- Durrstein	0-1 1-12 12-60	Silt loam-------- Silty clay, clay, clay loam. Clay loam, silt loam.	ML, CL, CL-ML CH, MH CH, CL	A-4, A-6 A-7 A-7, A-6	0 0 0	100 95-100 95-100	100 95-100 95-100	85-100 85-100 85-100	60-90 65-95 60-95	20-35 50-85 35-75	3-15 20-50 15-50

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Fd---------- Fedora	0-8	Loam----------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	55-70	25-35	5-10
	8-32	Sandy loam, fine sandy loam, loamy sand.	SC, SM, SM-SC	A-4, A-2	0	95-100	95-100	65-100	25-45	15-30	NP-10
	32-42	Sandy loam, loam, fine sandy loam.	CL, SC, SM-SC, CL-ML	A-4, A-6	0	95-100	95-100	60-95	35-65	20-35	5-15
	42-60	Loamy fine sand, fine sand, gravelly sand.	SM, SP-SM, SM-SC	A-1, A-2, A-3	0	60-100	50-100	30-75	5-25	<25	NP-5
Ha*:											
Haynie Variant--	0-7	Very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	80-100	25-40	5-15
	7-60	Silt loam, very fine sandy loam, loamy very fine sand.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-100	25-40	5-15
Munjor----------	0-8	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	95-100	65-100	30-55	15-30	NP-7
	8-60	Stratified loamy very fine sandy loam to silty clay loam.	SM, SC, ML, CL	A-4, A-6	0	100	95-100	85-100	35-65	25-40	5-15
HoA, HoB, HoC, HoD---------- Holt	0-5	Fine sandy loam	SM, SM-SC	A-4, A-2	0	100	95-100	90-100	25-45	15-30	NP-7
	5-23	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	25-45	20-35	NP-10
	23-30	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	90-100	70-100	25-45	20-35	NP-10
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ia---------- Inavale	0-11	Loamy sand-------	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	11-60	Fine sand, coarse sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
JaA, JaB, JaC---- Jansen	0-12	Loam----------	CL, ML	A-6, A-4	0	100	100	90-100	80-95	25-40	3-15
	12-31	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	70-80	30-45	10-25
	31-60	Coarse sand, sand, gravelly coarse sand.	SW, SW-SM, SP, SP-SM	A-3, A-1, A-2	0	85-100	45-100	35-65	3-10	---	NP
JbA*:											
Jansen----------	0-12	Loam----------	CL, ML	A-6, A-4	0	100	100	90-100	80-95	25-40	3-15
	12-31	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	70-80	30-45	10-25
	31-60	Coarse sand, sand, gravelly coarse sand.	SW, SW-SM, SP, SP-SM	A-3, A-1, A-2	0	85-100	45-100	35-65	3-10	---	NP
Brocksburg------	0-15	Loam----------	CL, ML	A-6, A-4	0	100	100	90-100	70-90	25-40	3-15
	15-36	Clay loam, loam	CL	A-7, A-6	0	100	100	90-100	70-80	35-45	11-20
	36-60	Sand and gravel, gravelly sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	85-95	40-90	20-60	3-15	---	NP
Ko---------- Kolls	0-4	Clay----------	CH, MH	A-7	0	100	100	95-100	85-100	50-90	25-50
	4-60	Clay----------	CH, MH	A-7	0	100	100	95-100	85-100	60-90	25-55
LaB, LaC, LaD---- Labu	0-6	Clay----------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-30	Silty clay, clay, very shaly clay.	CH, MH	A-7	0	80-100	80-100	75-100	75-100	50-85	20-50
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LcF*:											
Labu	0-6	Clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-30	Silty clay, clay, very shaly clay.	CH, MH	A-7	0	80-100	80-100	75-100	75-100	50-85	20-50
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sansarc	0-4	Clay	CH, MH	A-7	0	100	95-100	90-100	75-100	60-90	25-55
	4-18	Shaly clay, very shaly clay, clay.	CH, MH	A-7	0	80-100	75-100	75-100	75-100	60-90	25-55
	18-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	80-100	60-90	25-55
LoD*:											
Lakoma	0-6	Silty clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-29	Silty clay, clay, shaly clay.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Okaton	0-4	Silty clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	4-15	Clay, silty clay, very shaly clay.	CH, MH	A-7	0	80-100	75-100	75-100	75-100	50-85	20-50
	15-60	Weathered bedrock	CH, MH	A-7	0	100	95-100	90-100	85-100	50-100	20-65
LwB*, LwC*:											
Lakoma	0-6	Silty clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-29	Silty clay, clay, shaly clay.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Wewela	0-7	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-30	NP-7
	7-21	Fine sandy loam, sandy clay loam, loam.	SC, CL, SM	A-4, A-6, A-7	0	100	100	60-100	35-55	30-45	5-20
	21-36	Clay, shaly clay, shaly silty clay.	CH, MH	A-7	0	100	95-100	90-100	85-100	55-85	20-50
	36-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
MaD, MaF	0-5	Loam	CL	A-4, A-6	0	95-100	95-100	85-100	70-95	28-35	8-15
Mariaville	5-18	Loam, silty clay loam, silt loam.	CL	A-6	0	95-100	95-100	85-100	70-95	30-40	11-18
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
MdF*:											
Mariaville	0-5	Loam	CL	A-4, A-6	0	95-100	95-100	85-100	70-95	28-35	8-15
	5-18	Loam, silty clay loam, silt loam.	CL	A-6	0	95-100	95-100	85-100	70-95	30-40	11-18
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Labu	0-6	Clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-30	Silty clay, clay, very shaly clay.	CH, MH	A-7	0	80-100	80-100	75-100	75-100	50-85	20-50
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Anselmo	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<20	NP-5
	8-23	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<24	NP-5
	23-48	Fine sandy loam, loamy fine sand, fine sand.	SM, SP-SM	A-4, A-2	0	100	100	65-100	12-45	<20	NP
	48-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MeC, MeE---------- Meadin	0-11	Sandy loam-------	SM, ML, CL-ML, SM-SC	A-2, A-4	0	85-100	75-95	45-80	25-55	<20	NP-5
	11-17	Sandy loam, loamy sand, gravelly sandy loam.	SM, SP-SM, GM, GP-GM	A-3, A-2	0	50-90	50-90	50-65	5-35	<20	NP
	17-60	Gravelly coarse sand, very gravelly coarse sand, gravelly sand.	SP-SM, SP, GP-GM, GP	A-1	0	40-80	30-70	15-50	1-10	<20	NP
MoA, MoB, MoC---- Millboro	0-6	Silty clay-------	CL, CH	A-7	0	100	100	90-100	75-100	40-60	15-35
	6-28	Clay, silty clay	CH, MH	A-7	0	100	100	90-100	85-100	50-80	20-50
	28-60	Silty clay, clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-80	20-50
MpB*, MpC*: Millboro--------	0-6	Silty clay-------	CL, CH	A-7	0	100	100	90-100	75-100	40-60	15-35
	6-28	Clay, silty clay	CH, MH	A-7	0	100	100	90-100	85-100	50-80	20-50
	28-60	Silty clay, clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-80	20-50
Lakoma----------	0-6	Silty clay-------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-29	Silty clay, clay, shaly clay.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mr---------- Mosher	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	70-100	25-40	5-20
	12-19	Clay loam, clay, silty clay.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30
	19-34	Clay loam, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	70-100	35-60	10-35
	34-60	Stratified loamy sand to clay.	CL, SC, GC, CL-ML	A-4, A-6, A-7	0	55-100	45-100	40-90	35-80	20-45	5-20
Ms*: Mosher----------	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	70-100	25-40	5-20
	12-19	Clay loam, clay, silty clay.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30
	19-34	Clay loam, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	70-100	35-60	10-35
	34-60	Stratified loamy sand to clay.	CL, SC, GC, CL-ML	A-4, A-6, A-7	0	55-100	45-100	40-90	35-80	20-45	5-20
Jerauld----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	3-19	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	19-60	Silty clay, clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
ObE*: Okaton----------	0-4	Silty clay-------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	4-15	Clay, silty clay, very shaly clay.	CH, MH	A-7	0	80-100	75-100	75-100	75-100	50-85	20-50
	15-60	Weathered bedrock	CH, MH	A-7	0	100	95-100	90-100	85-100	50-100	20-65
Lakoma----------	0-6	Silty clay-------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	6-29	Silty clay, clay, shaly clay.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-85	20-50
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OcF*: Okaton----------	0-4	Bouldery silty clay.	CH, MH	A-7	25-50	100	95-100	90-100	85-100	50-85	20-50
	4-15	Clay, silty clay, very shaly clay.	CH, MH	A-7	25-50	80-100	75-100	75-100	75-100	50-85	20-50
	15-60	Weathered bedrock	CH, MH	A-7	---	100	95-100	90-100	85-100	50-100	20-65

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
OcF*:											
Mariaville------	0-5	Loam----------	CL	A-4, A-6	0	95-100	95-100	85-100	70-95	28-35	8-15
	5-18	Loam, silty clay loam, silt loam.	CL	A-6	0	95-100	95-100	85-100	70-95	30-40	11-18
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OeC---------- O'Neill	0-10	Fine sandy loam, sandy loam.	SM, ML, CL, SM-SC	A-4	0	95-100	95-100	70-85	35-55	<25	NP-10
	10-23	Fine sandy loam, sandy loam.	SC, SM-SC	A-2, A-4	0	95-100	95-100	60-75	30-50	<30	4-10
	23-60	Stratified sand to gravelly sand.	SP, SP-SM	A-1, A-2, A-3	0	70-100	50-90	25-60	0-5	---	NP
On---------- Onita	0-12	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	95-100	90-100	70-100	30-45	5-20
	12-32	Silty clay loam, clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	75-100	35-60	10-35
	32-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	65-100	30-55	10-30
Ot---------- Onita	0-12	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	95-100	90-100	70-100	30-45	7-20
	12-32	Silty clay loam, clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	75-100	35-60	10-35
	32-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	65-100	30-55	10-30
Pg*. Pits, gravel											
Pm---------- Platte	0-4	Loam----------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	4-14	Sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	75-95	45-75	<20	NP-5
	14-60	Gravelly coarse sand, coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-95	25-65	5-15	<20	NP
PrA, PrB, PrC---- Promise	0-10	Clay----------	CH, MH	A-7	0	100	100	90-100	80-100	55-70	25-40
	10-31	Clay----------	CH, MH	A-7	0	100	100	90-100	85-100	60-85	25-50
	31-60	Clay, silty clay	CH, MH	A-7	0	100	100	90-100	85-100	60-90	25-55
RaA, RaB, RaC---- Ree	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	70-95	25-40	5-15
	8-33	Loam, clay loam	CL	A-6, A-7	0	95-100	90-100	70-100	65-85	30-45	10-20
	33-42	Stratified fine sand to clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	95-100	85-100	70-100	35-85	25-40	5-15
	42-60	Loamy fine sand, fine sandy loam.	SM	A-2	0	95-100	90-100	70-95	15-35	<20	NP-5
RbA---------- Ree	0-13	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	70-95	25-40	5-15
	13-33	Clay loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0	100	90-100	70-100	65-85	30-45	10-20
	33-45	Clay loam, silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-100	40-55	15-30
	45-60	Gravelly sand, gravelly loamy sand.	SM, SW-SM, SM-SC, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	<25	NP-5

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RcC*:											
Ree	0-8	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	70-95	25-40	5-15
	8-33	Loam, clay loam	CL	A-6, A-7	0	95-100	90-100	70-100	65-85	30-45	10-20
	33-42	Stratified fine sand to clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	95-100	85-100	70-100	35-85	25-40	5-15
	42-60	Loamy fine sand, fine sand.	SM	A-2	0	95-100	90-100	70-95	15-35	<20	NP-5
Tassel	0-7	Fine sandy loam	ML, SM	A-4	0	95-100	90-100	75-100	40-65	<35	NP-7
	7-14	Fine sandy loam, loamy very fine sand, sandy loam.	ML, SM	A-4	0	95-100	90-100	65-95	40-65	<35	NP-7
	14-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2 Reliance	0-7	Silty clay loam	CL, ML, CH, MH	A-6, A-7	0	100	100	95-100	80-100	35-55	15-25
	7-26	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-60	15-30
	26-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	70-100	30-55	10-30
Rv*. Riverwash											
ScE*:											
Sansarc	0-4	Clay	CH, MH	A-7	0	100	95-100	90-100	75-100	60-90	25-55
	4-18	Shaly clay, very shaly clay, clay.	CH, MH	A-7	0	80-100	75-100	75-100	75-100	60-90	25-55
	18-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	80-100	60-90	25-55
Rock outcrop.											
So Scott	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	2-20
	9-28	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	28-60	Silt loam, silty clay loam, clay.	CL	A-4, A-6, A-7	0	100	100	90-100	90-100	25-50	8-24
TrE*:											
Tassel	0-7	Fine sandy loam	ML, SM	A-4	0	95-100	90-100	75-100	40-65	<35	NP-7
	7-14	Fine sandy loam, loamy very fine sand, sandy loam.	ML, SM	A-4	0	95-100	90-100	65-95	40-65	<35	NP-7
	14-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
UlA, UlB	0-8	Silt loam	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
Uly	8-20	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	20-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
VaC, VaD Valentine	0-6	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	6-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-20	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Vt Vetal	0-7	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	85-100	40-55	20-35	3-10
	7-23	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	100	95-100	60-95	25-65	20-30	3-10
	23-60	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	100	95-100	60-95	30-65	20-30	3-10
Wd Wendte	0-5	Silty clay	CH, MH	A-7	0	100	100	90-100	85-100	50-80	20-45
	5-60	Stratified silty clay loam to clay.	CL, CH, MH	A-7	0	100	100	90-100	70-100	45-80	20-45
We Wendte	0-5	Silty clay	CH, MH	A-7	0	100	100	90-100	85-100	50-80	20-45
	5-60	Stratified silty clay loam to clay.	CL, CH	A-7	0	100	100	90-100	70-100	45-80	20-45
Wh Whitelake	0-13	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	70-100	30-55	<25	NP-5
	13-15	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	100	100	70-100	30-50	<25	NP-5
	15-30	Sandy clay loam, fine sandy loam.	SM-SC, CL-ML, SC, CL	A-4, A-6	0	100	100	60-100	35-55	25-40	6-20
	30-60	Stratified sand to silt loam.	ML, CL, SM, SC	A-2, A-4, A-6	0	100	95-100	60-100	20-65	15-35	NP-12
Wn Witten	0-11	Silty clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-50
	11-28	Clay, silty clay	CH, MH	A-7	0	100	100	95-100	90-100	50-85	20-55
	28-60	Clay, silty clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-50

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
AaA, AaB--------- Agar	0-7 7-19 19-60	0.6-2.0 0.6-2.0 0.6-2.0	0.19-0.22 0.17-0.22 0.17-0.20	6.1-7.3 6.6-7.8 7.4-8.4	<2 <2 <2	Moderate---- Moderate---- Low---------	0.32 0.43 0.43	5	6	2-4
AdC*: Anselmo--------- Dunday---------- AhB*, AhC*: Anselmo--------- Holt------------ AtE*: Anselmo--------- Tassel---------- BaE------------- Betts Bb, Bc----------- Bon BlD*: Boro------------ Lakoma---------- BmB*, BmC*: Boro------------ Millboro-------- CaA*: Carter---------- Hurley---------- 	0-8 8-23 23-48 48-60 0-17 17-60 0-8 8-23 23-48 48-60 0-5 5-23 23-30 30-60 0-8 8-23 23-48 48-60 0-7 7-14 14-60 0-5 5-60 0-27 27-60 0-5 5-60 0-6 6-29 29-60 0-5 5-60 0-6 6-28 28-60 0-6 6-23 23-60 0-4 4-60	0.6-6.0 2.0-6.0 2.0-6.0 --- 6.0-20 6.0-20 0.6-6.0 2.0-6.0 2.0-6.0 --- 0.6-6.0 0.6-6.0 0.6-6.0 --- 0.6-6.0 2.0-6.0 2.0-6.0 --- 2.0-6.0 2.0-6.0 --- 0.6-2.0 0.2-0.6 0.6-2.0 0.6-6.0 0.06-0.2 0.06-0.2 0.06-0.2 --- 0.06-0.2 0.06-0.2 0.06-0.2 0.06-0.2 0.06-0.2 0.6-2.0 <0.06 <0.2 0.6-2.0 <0.06	0.13-0.18 0.15-0.19 0.08-0.16 --- 0.10-0.12 0.09-0.11 0.13-0.18 0.15-0.19 0.08-0.16 --- 0.14-0.17 0.10-0.16 0.10-0.16 --- 0.13-0.18 0.15-0.19 0.08-0.16 --- 0.16-0.18 0.15-0.17 --- 0.16-0.18 0.17-0.20 0.19-0.22 0.11-0.16 0.08-0.12 0.08-0.12 0.08-0.12 0.08-0.12 --- 0.08-0.12 0.08-0.12 0.13-0.19 0.08-0.16 0.08-0.16 0.19-0.22 0.08-0.14 0.08-0.12 0.19-0.22 0.05-0.13	5.6-7.8 5.6-7.8 5.6-7.8 --- 6.1-7.3 6.1-7.8 5.6-7.8 5.6-7.8 5.6-7.8 --- 6.6-7.8 6.6-7.8 7.4-8.4 --- 5.6-7.8 5.6-7.8 5.6-7.8 --- 7.4-8.4 7.4-8.4 --- 6.6-8.4 7.4-8.4 6.6-8.4 7.4-8.4 7.4-8.4 7.4-8.4 --- 7.4-8.4 7.4-8.4 6.6-7.8 6.6-7.8 7.4-8.4 6.1-7.8 6.6-8.4 7.4-8.4 6.1-7.3 7.4-9.0	<2 <2 <2 --- <2 <2 <2 <2 <2 --- <2 <2 <2 --- <2 <2 <2 --- <2 <2 --- <2 2-8 <2 <2 <2 <2 --- <2 <2 <2 <2 2-4 <2 2-8 2-8 <2 4-16	Low--------- Low--------- Low--------- --- Low--------- Low--------- Low--------- Low--------- Low--------- --- Low--------- Low--------- Low--------- --- Low--------- Low--------- Low--------- --- Low--------- Low--------- --- Moderate---- Moderate---- Low--------- Low--------- High-------- Very high High-------- High-------- --- High-------- Very high High-------- Very high Very high Moderate---- Very high Very high Moderate---- Very high	0.20 0.20 0.20 --- 0.17 0.17 0.20 0.20 0.20 --- 0.20 0.20 0.20 --- 0.20 0.20 0.20 --- 0.24 0.24 --- 0.28 0.37 0.24 0.32 0.37 0.37 0.37 0.37 --- 0.37 0.37 0.37 0.37 0.37 0.37 0.37 0.37 0.43 0.43	5 5 5 4 5 2 5 6 5 4 5 5 3 1 	3 2 3 3 3 3 4L 6 4 4 4 4 7 6 	1-3 1-2 1-3 1-3 1-3 .5-1 1-3 4-6 1-3 1-3 2-4 2-4 1-2

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
CbA*:										
Carter----------	0-6	0.6-2.0	0.19-0.22	6.1-7.8	<2	Moderate----	0.37	3	7	2-4
	6-23	<0.06	0.08-0.14	6.6-8.4	2-8	Very high	0.37			
	23-60	<0.2	0.08-0.12	7.4-8.4	2-8	Very high	0.37			
Promise---------	0-10	<0.2	0.10-0.14	6.1-7.8	<2	Very high	0.37	5	4	2-4
	10-31	<0.2	0.08-0.14	7.4-9.0	<2	Very high	0.37			
	31-60	<0.2	0.10-0.12	7.4-9.0	2-4	Very high	0.37			
Cd----------	0-19	2.0-6.0	0.16-0.18	5.6-7.3	<2	Low---------	0.20	5	3	2-4
Cass	19-60	2.0-6.0	0.15-0.17	6.1-8.4	<2	Low---------	0.20			
CrC, CrE---------	0-5	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low---------	0.43	5	6	1-2
Coly	5-60	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low---------	0.43			
DaA----------	0-17	6.0-20	0.10-0.12	6.1-7.3	<2	Low---------	0.17	5	2	1-2
Dunday	17-60	6.0-20	0.09-0.11	6.1-7.8	<2	Low---------	0.17			
Du----------	0-1	0.6-2.0	0.17-0.20	6.1-7.3	4-16	Low---------	0.37	1	6	1-3
Durrstein	1-12	<0.2	0.10-0.15	6.6-9.0	4-16	High--------	0.37			
	12-60	<0.2	0.08-0.13	7.4-9.0	4-16	High--------	0.37			
Fd----------	0-8	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low---------	0.20	5	4L	2-4
Fedora	8-32	2.0-6.0	0.10-0.14	7.4-9.0	<2	Low---------	0.20			
	32-42	2.0-6.0	0.09-0.15	6.6-9.0	<2	Low---------	0.20			
	42-60	6.0-20	0.03-0.10	6.6-9.0	<2	Low---------	0.10			
Ha*:										
Haynie Variant--	0-7	0.6-2.0	0.17-0.20	7.4-8.4	<2	Low---------	0.32	5	4L	<2
	7-60	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low---------	0.32			
Munjor----------	0-8	2.0-6.0	0.14-0.20	7.4-8.4	<2	Low---------	0.24	5	3	.5-1
	8-60	2.0-6.0	0.13-0.18	7.4-8.4	<2	Low---------	0.24			
HoA, HoB, HoC, HoD----------	0-5	0.6-6.0	0.14-0.17	6.6-7.8	<2	Low---------	0.20	4	3	1-3
Holt	5-23	0.6-6.0	0.10-0.16	6.6-7.8	<2	Low---------	0.20			
	23-30	0.6-6.0	0.10-0.16	7.4-8.4	<2	Low---------	0.20			
	30-60	---	---	---	---	----------	----			
Ia----------	0-11	6.0-20	0.10-0.12	6.6-7.8	<2	Low---------	0.17	5	2	.5-1
Inavale	11-60	6.0-20	0.06-0.11	6.6-8.4	<2	Low---------	0.17			
JaA, JaB, JaC----	0-12	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low---------	0.32	4	6	2-4
Jansen	12-31	0.6-2.0	0.15-0.19	5.1-7.3	<2	Moderate----	0.32			
	31-60	>20	0.02-0.04	5.1-7.3	<2	Low---------	0.10			
JbA*:										
Jansen----------	0-12	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low---------	0.32	4	6	2-4
	12-31	0.6-2.0	0.15-0.19	5.1-7.3	<2	Moderate----	0.32			
	31-60	>20	0.02-0.04	5.1-7.3	<2	Low---------	0.10			
Brocksburg------	0-15	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low---------	0.28	4	5	4-6
	15-36	0.6-2.0	0.15-0.19	6.6-7.8	<2	Moderate----	0.28			
	36-60	>20	0.02-0.04	6.6-7.8	<2	Low---------	0.10			
Ko----------	0-4	<0.06	0.10-0.14	7.4-8.4	<2	Very high	0.37	5	4	2-4
Kolls	4-60	<0.06	0.08-0.12	7.4-8.4	<2	Very high	0.37			
LaB, LaC, LaD----	0-6	0.06-0.2	0.08-0.14	6.6-8.4	<2	Very high	0.37	4	4	1-3
Labu	6-30	0.06-0.2	0.08-0.14	7.4-8.4	<2	Very high	0.37			
	30-60	---	---	---	---	----------	----			
LcF*:										
Labu----------	0-6	0.06-0.2	0.08-0.14	6.6-8.4	<2	Very high	0.37	4	4	1-3
	6-30	0.06-0.2	0.08-0.14	7.4-8.4	<2	Very high	0.37			
	30-60	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
LcF*:										
Sansarc	0-4	0.06-0.2	0.08-0.12	6.6-8.4	<2	Very high	0.37	2	4	1-2
	4-18	0.06-0.2	0.08-0.12	7.4-8.4	<2	Very high	0.37			
	18-60	---	---	---	---	---	---			
LoD*:										
Lakoma	0-6	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37	4	4	1-3
	6-29	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37			
	29-60	---	---	---	---	---	---			
Okaton	0-4	0.06-0.2	0.11-0.16	7.4-8.4	<2	High	0.37	2	4	1-2
	4-15	0.06-0.2	0.11-0.16	7.4-8.4	<2	High	0.37			
	15-60	---	---	---	---	---	---			
LwB*, LwC*:										
Lakoma	0-6	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37	4	4	1-3
	6-29	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37			
	29-60	---	---	---	---	---	---			
Wewela	0-7	2.0-6.0	0.14-0.17	6.1-7.3	<2	Low	0.20	4	3	2-4
	7-21	0.6-2.0	0.16-0.18	6.1-7.3	<2	Moderate	0.32			
	21-36	<0.2	0.08-0.12	6.6-8.4	<2	High	0.32			
	36-60	---	---	---	---	---	---			
MaD, MaF	0-5	0.6-2.0	0.20-0.24	6.6-7.8	<2	Low	0.37	2	6	1-2
Mariaville	5-18	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.37			
	18-60	---	---	---	---	---	---			
MdF*:										
Mariaville	0-5	0.6-2.0	0.20-0.24	6.6-7.8	<2	Low	0.37	2	6	1-2
	5-18	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.37			
	18-60	---	---	---	---	---	---			
Labu	0-6	0.06-0.2	0.08-0.14	6.6-8.4	<2	Very high	0.37	4	4	1-3
	6-30	0.06-0.2	0.08-0.14	7.4-8.4	<2	Very high	0.37			
	30-60	---	---	---	---	---	---			
Anselmo	0-8	0.6-6.0	0.13-0.18	5.6-7.8	<2	Low	0.20	5	3	1-3
	8-23	2.0-6.0	0.15-0.19	5.6-7.8	<2	Low	0.20			
	23-48	2.0-6.0	0.08-0.16	5.6-7.8	<2	Low	0.20			
	48-60	---	---	---	---	---	---			
MeC, MeE	0-11	0.6-2.0	0.13-0.18	5.1-7.3	<2	Low	0.20	3	3	1-2
Meadin	11-17	6.0-20	0.09-0.11	5.1-7.3	<2	Low	0.10			
	17-60	>20	0.02-0.05	6.1-7.3	<2	Low	0.10			
MoA, MoB, MoC	0-6	0.06-0.2	0.13-0.19	6.6-7.8	<2	High	0.37	5	4	2-4
Millboro	6-28	0.06-0.2	0.08-0.16	6.6-7.8	<2	Very high	0.37			
	28-60	0.06-0.2	0.08-0.16	7.4-8.4	2-4	Very high	0.37			
MpB*, MpC*:										
Millboro	0-6	0.06-0.2	0.13-0.19	6.6-7.8	<2	High	0.37	5	4	2-4
	6-28	0.06-0.2	0.08-0.16	6.6-7.8	<2	Very high	0.37			
	28-60	0.06-0.2	0.08-0.16	7.4-8.4	2-4	Very high	0.37			
Lakoma	0-6	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37	4	4	1-3
	6-29	0.06-0.2	0.08-0.12	7.4-8.4	<2	High	0.37			
	29-60	---	---	---	---	---	---			
Mr	0-12	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.43	3	6	1-3
Mosher	12-19	<0.06	0.08-0.19	6.6-8.4	2-4	High	0.32			
	19-34	0.06-0.2	0.11-0.22	7.9-9.0	4-16	High	0.32			
	34-60	0.2-2.0	0.08-0.12	7.9-9.0	4-16	Moderate	0.32			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
Ms*:										
Mosher----------	0-12	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate----	0.43	3	6	1-3
	12-19	<0.06	0.08-0.19	6.6-8.4	2-4	High--------	0.32			
	19-34	0.06-0.2	0.11-0.22	7.9-9.0	4-16	High--------	0.32			
	34-60	0.2-2.0	0.08-0.12	>7.9	4-16	Moderate----	0.32			
Jerauld---------	0-3	0.6-2.0	0.18-0.22	5.6-7.3	<4	Moderate----	0.43	1	6	1-3
	3-19	<0.2	0.10-0.15	6.6-8.4	2-8	High--------	0.32			
	19-60	<0.2	0.08-0.13	7.4-9.0	4-16	High--------	0.32			
ObE*:										
Okaton----------	0-4	0.06-0.2	0.11-0.16	7.4-8.4	<2	High--------	0.37	2	4	1-2
	4-15	0.06-0.2	0.11-0.16	7.4-8.4	<2	High--------	0.37			
	15-60	---	---	---	---	----------	----			
Lakoma----------	0-6	0.06-0.2	0.08-0.12	7.4-8.4	<2	High--------	0.37	4	4	1-3
	6-29	0.06-0.2	0.08-0.12	7.4-8.4	<2	High--------	0.37			
	29-60	---	---	---	---	----------	----			
OcF*:										
Okaton----------	0-4	0.06-0.2	0.11-0.16	7.4-8.4	<2	High--------	0.37	2	4	1-2
	4-15	0.06-0.2	0.11-0.16	7.4-8.4	<2	High--------	0.37			
	15-60	---	---	---	---	----------	----			
Mariaville------	0-5	0.6-2.0	0.20-0.24	6.6-7.8	<2	Low---------	0.37	2	6	1-2
	5-18	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low---------	0.37			
	18-60	---	---	---	---	----------	----			
OeC---------------	0-10	2.0-20	0.10-0.18	5.1-6.5	<2	Low---------	0.20	4	3	1-3
O'Neill	10-23	2.0-6.0	0.15-0.17	6.6-7.3	<2	Low---------	0.20			
	23-60	>20	0.02-0.04	6.6-7.3	<2	Low---------	0.10			
On----------------	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate----	0.28	5	6	4-6
Onita	12-32	0.2-0.6	0.11-0.17	6.1-7.3	<2	High--------	0.28			
	32-60	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate----	0.43			
Ot----------------	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate----	0.28	5	6	4-6
Onita	12-32	0.2-0.6	0.11-0.17	6.1-7.3	<2	High--------	0.43			
	32-60	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate----	0.43			
Pg*.										
Pits, gravel										
Pm----------------	0-4	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low---------	0.28	2	5	1-3
Platte	4-14	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low---------	0.28			
	14-60	>20	0.02-0.04	6.6-8.4	<2	Low---------	0.10			
PrA, PrB, PrC-----	0-10	<0.2	0.10-0.14	6.1-7.8	<2	Very high	0.37	5	4	2-4
Promise	10-31	<0.2	0.08-0.14	7.4-9.0	<2	Very high	0.37			
	31-60	<0.2	0.10-0.12	7.4-9.0	2-4	Very high	0.37			
RaA, RaB, RaC-----	0-8	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate----	0.28	5	6	2-4
Ree	8-33	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate----	0.28			
	33-42	0.6-2.0	0.09-0.20	7.4-8.4	<2	Moderate----	0.28			
	42-60	6.0-20	0.06-0.10	7.4-8.4	<2	Low---------	0.17			
RbA---------------	0-13	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate----	0.28	5	6	2-4
Ree	13-33	0.6-2.0	0.17-0.22	6.6-8.4	<2	Moderate----	0.28			
	33-45	0.2-0.6	0.14-0.18	7.4-8.4	<2	High--------	0.37			
	45-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low---------	0.10			
RcC*:										
Ree---------------	0-8	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate----	0.28	5	6	2-4
	8-33	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate----	0.28			
	33-42	0.6-2.0	0.09-0.20	7.4-8.4	<2	Moderate----	0.28			
	42-60	6.0-20	0.06-0.10	7.4-8.4	<2	Low---------	0.17			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
RcC*:										
Tassel----------	0-7	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low---------	0.24	2	3	.5-1
	7-14	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low---------	0.24			
	14-60	---	---	---	---	----------	----			
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2----------	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate----	0.32	5	7	1-4
Reliance	7-26	0.2-0.6	0.11-0.19	6.6-8.4	<2	High--------	0.32			
	26-60	0.2-2.0	0.14-0.20	7.4-8.4	<2	Moderate----	0.32			
Rv*.										
Riverwash										
ScE*:										
Sansarc----------	0-4	0.06-0.2	0.08-0.12	6.6-8.4	<2	Very high	0.37	2	4	1-2
	4-18	0.06-0.2	0.08-0.12	7.4-8.4	<2	Very high	0.37			
	18-60	---	---	---	---	----------	----			
Rock outcrop.										
So----------	0-9	0.6-2.0	0.21-0.24	5.6-7.3	<2	Low---------	0.37	3	6	2-4
Scott	9-28	<0.06	0.10-0.14	5.6-7.8	<2	High--------	0.37			
	28-60	0.6-2.0	0.14-0.22	6.6-8.4	<2	Moderate----	0.37			
TrE*:										
Tassel----------	0-7	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low---------	0.24	2	3	.5-1
	7-14	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low---------	0.24			
	14-60	---	---	---	---	----------	----			
Rock outcrop.										
UlA, UlB----------	0-8	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low---------	0.32	5	6	1-3
Uly	8-20	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low---------	0.43			
	20-60	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low---------	0.43			
VaC, VaD----------	0-6	6.0-20	0.10-0.12	5.6-7.3	<2	Low---------	0.15	5	2	.5-1
Valentine	6-60	6.0-20	0.05-0.11	5.6-7.3	<2	Low---------	0.15			
Vt----------	0-7	2.0-6.0	0.14-0.17	6.1-7.8	<2	Low---------	0.20	5	3	4-6
Vetal	7-23	2.0-6.0	0.11-0.19	6.1-7.8	<2	Low---------	0.20			
	23-60	2.0-6.0	0.10-0.17	6.1-8.4	<2	Low---------	0.20			
Wd----------	0-5	0.06-0.2	0.13-0.18	7.4-8.4	<2	High--------	0.28	5	4	2-4
Wendte	5-60	0.06-0.2	0.11-0.17	7.4-8.4	<2	High--------	0.28			
We----------	0-5	0.06-0.2	0.13-0.18	7.4-8.4	<2	High--------	0.28	5	4	3-5
Wendte	5-60	2.0-6.0	0.11-0.17	7.4-8.4	<2	High--------	0.28			
Wh----------	0-13	0.6-2.0	0.11-0.17	5.6-7.8	<2	Low---------	0.24	3	3	1-3
Whitelake	13-15	0.6-6.0	0.09-0.15	5.6-7.8	<2	Low---------	0.24			
	15-30	0.06-0.2	0.10-0.15	>7.3	4-16	Low---------	0.32			
	30-60	2.0-6.0	0.06-0.17	>7.3	2-8	Low---------	0.32			
Wn----------	0-11	0.06-0.2	0.10-0.14	6.6-7.8	<2	Very high	0.37	5	4	3-5
Witten	11-28	0.06-0.2	0.10-0.14	6.6-7.8	<2	Very high	0.37			
	28-60	0.06-0.2	0.08-0.12	7.4-8.4	2-4	Very high	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AaA, AaB---------- Agar	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
AdC*:												
Anselmo----------	A	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	Low.
Dunday----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
AhB*, AhC*:												
Anselmo----------	A	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	Low.
Holt----------	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
AtE*:												
Anselmo----------	A	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	Low.
Tassel----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	High-----	Low.
BaE---------- Betts	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Bb---------- Bon	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bc---------- Bon	B	Frequent----	Brief-----	Apr-Oct	4.0-6.0	Apparent	Oct-Jul	>60	---	High-----	Moderate	Low.
BlD*:												
Boro----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Lakoma----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
BmB*, BmC*:												
Boro----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Millboro----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
CaA*:												
Carter----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Hurley----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
CbA*:												
Carter----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Promise----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Cd---------- Cass	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Moderate	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
CrC, CrE---------- Coly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
DaA---------- Dunday	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Du---------- Durrstein	D	Occasional	Brief-----	Apr-Oct	0-1.0	Apparent	Oct-Jun	>60	---	Moderate	High-----	High.
Fd---------- Fedora	B/D	Rare--------	---	---	1.0-4.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Low.
Ha*: Haynie Variant---	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Munjor----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
HoA, HoB, HoC, HoD---------- Holt	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
Ia---------- Inavale	A	Occasional	Very brief	Jan-Jul	>6.0	---	---	>60	---	Low------	Moderate	Low.
JaA, JaB, JaC----- Jansen	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
JbA*: Jansen----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Brocksburg-------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ko---------- Kolls	D	None--------	---	---	+.5-1.5	Perched	Apr-Jun	>60	---	Moderate	High-----	Moderate.
LaB, LaC, LaD----- Labu	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
LcF*: Labu----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Sansarc----------	D	None--------	---	---	>6.0	---	---	4-20	Soft	Low------	High-----	Moderate.
LoD*: Lakoma----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Okaton----------	D	None--------	---	---	>6.0	---	---	8-20	Soft	Low------	High-----	High.
LwB*, LwC*: Lakoma----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Wewela----------	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MaD, MaF---------- Mariaville	D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Low.
MdF*: Mariaville-------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Low.
Labu----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Anselmo----------	A	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	Low.
MeC, MeE---------- Meadin	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
MoA, MoB, MoC----- Millboro	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
MpB*, MpC*: Millboro---------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Lakoma----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Mr---------- Mosher	D	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Ms*: Mosher----------	D	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Jerauld----------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
ObE*: Okaton----------	D	None--------	---	---	>6.0	---	---	8-20	Soft	Low------	High-----	High.
Lakoma----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
OcF*: Okaton----------	D	None--------	---	---	>6.0	---	---	8-20	Soft	Low------	High-----	High.
Mariaville-------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Low.
OeC---------- O'Neill	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
On---------- Onita	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Ot---------- Onita	C	Occasional	Brief-----	Mar-Oct	2.5-6.0	Perched	Apr-Jun	>60	---	High-----	High-----	Low.
Pg*. Pits, gravel												
Pm---------- Platte	B	Occasional	Brief-----	Mar-Oct	1.0-2.0	Apparent	Feb-Jun	>60	---	Moderate	High-----	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
PrA, PrB, PrC----- Promise	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
RaA, RaB, RaC----- Ree	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
RbA---------- Ree	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
RcC*: Ree----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Tassel----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	High-----	Low.
ReA, ReB, ReB2, ReC, ReC2, ReD, ReD2---------- Reliance	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Rv*. Riverwash												
ScE*: Sansarc----------	D	None--------	---	---	>6.0	---	---	4-20	Soft	Low------	High-----	Moderate.
Rock outcrop.												
So---------- Scott	D	None--------	---	---	+.5-1.0	Perched	Mar-Aug	>60	---	High-----	High-----	Low.
TrE*: Tassel----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	High-----	Low.
Rock outcrop.												
UlA, UlB---------- Uly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
VaC, VaD---------- Valentine	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Vt---------- Vetal	B	Occasional	Very brief	Mar-Oct	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Wd---------- Wendte	D	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
We---------- Wendte	D	Frequent----	Brief-----	Apr-Oct	>6.0	---	---	>60	---	Low------	High-----	Low.
Wh---------- Whitelake	B	None--------	---	---	2.0-4.0	Perched	Apr-Jul	>60	---	High-----	High-----	Moderate.
Wn---------- Witten	D	Occasional	Very brief	Apr-Jun	>6.0	---	---	>60	---	Moderate	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution							Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve				Percentage smaller than--						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
										Pct		Lb/ft^3	Pct
Boro silty clay: (SHD-77-053-6)													
Ap------ 0 to 5	A-7-5(17)	MH	--	100	99	98	--	57	--	56	25	112	88
Bw, Bk, BCk---- 5 to 31	A-7-5(17)	MH	--	--	100	99	--	71	--	57	26	95	24
C------- 31 to 60	A-7-6(20)	CH	--	100	98	93	--	69	--	65	36	95	24
Labu clay: (SHD-77-053-1)													
Ap------ 0 to 6	A-7-5(20)	CH	99	98	96	94	--	70	--	79	43	82	32
Bw------ 6 to 21	A-7-5(20)	CH	--	100	98	97	--	73	--	85	49	83	32
Labu clay: (SHD-77-053-39)													
Ap------ 0 to 5	A-7-5(20)	CH	--	100	98	96	--	67	--	79	49	86	30
Bw1----- 5 to 18	A-7-6(20)	CH	--	100	99	97	--	71	--	79	50	90	27
Lakoma silty clay: (SHD-77-053-3)													
Ap------ 0 to 6	A-7-5(17)	MH	--	--	100	97	--	71	--	55	25	89	28
Bw, BC-- 6 to 25	A-7-5(20)	CH	--	--	100	99	--	75	--	65	34	86	30
Lakoma silty clay: (SHD-77-053-38)													
Ap------ 0 to 5	A-7-6(20)	CH	--	100	99	98	--	65	--	69	42	91	26
Bw------ 5 to 13	A-7-6(20)	CH	--	100	99	98	--	67	--	70	42	93	25
BCk----- 13 to 24	A-7-6(20)	CH	--	100	99	98	--	65	--	76	49	96	24
Millboro silty clay: (SHD-77-053-5)													
A------- 0 to 8	A-7-5(17)	MH	--	--	100	99	--	59	--	58	26	86	30
Bt------ 8 to 29	A-7-6(19)	CH	--	--	100	99	--	61	--	58	30	90	27
BCk----- 29 to 39	A-7-6(19)	CH	--	--	100	99	--	53	--	53	29	96	24
C------- 39 to 60	A-7-6(17)	CH	--	100	99	98	--	49	--	51	28	97	23
Okaton silty clay: (SHD-77-053-4)													
A, AC, Cy----- 0 to 15	A-7-5(20)	MH	--	100	98	87	--	60	--	59	29	93	25
Onita silt loam: (SHD-78-053-4)													
Ap, A--- 0 to 12	A-7-6(11)	ML	--	100	99	91	--	31	--	44	15	89	28
Bt------ 12 to 32	A-7-6(18)	CH	--	100	99	93	--	45	--	51	30	96	24
BC------ 32 to 38	A-7-6(17)	CL	--	--	100	98	--	47	--	49	27	100	21
Ck------ 38 to 60	A-7-6(15)	CL	--	100	99	92	--	41	--	45	24	104	20

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution							Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve				Percentage smaller than--						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
										Pct		Lb/ft^3	Pct
Reliance silty loam: (SHD-78-053-1)													
A------- 0 to 7	A-7-5(13)	MH	--	--	100	95	--	29	--	52	16	86	30
Bt------ 7 to 25	A-7-6(18)	CH	--	--	100	96	--	43	--	53	27	92	27
Wendte silty clay: (SHD-77-053-2)													
A------- 0 to 5	A-7-5(20)	CH	--	--	100	95	--	61	--	64	34	86	30
C1, C2-- 5 to 18	A-7-5(20)	MH	--	--	100	99	--	71	--	70	35	83	32
C3, C4-- 18 to 60	A-7-5(20)	CH	--	--	100	99	--	75	--	74	41	83	32
Witten silty clay: (SHD-78-053-2)													
Ap, A--- 0 to 11	A-7-6(19)	CH	--	100	99	97	--	58	--	57	30	86	30
Bt, BC-- 11 to 39	A-7-6(20)	CH	--	--	100	99	--	72	--	72	44	86	30
Cy------ 39 to 60	A-7-6(20)	CH	--	--	100	98	--	67	--	73	46	90	27

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Agar	Fine-silty, mixed, mesic Typic Argiustolls
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Betts	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
Bon	Fine-loamy, mixed, mesic Cumulic Haplustolls
Boro	Fine, montmorillonitic, mesic Vertic Ustochrepts
Brocksburg	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Argiustolls
Carter	Very fine, montmorillonitic, mesic Vertic Paleustolls
Cass	Coarse-loamy, mixed, mesic Fluventic Haplustolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Dunday	Sandy, mixed, mesic Entic Haplustolls
Durrstein	Fine, montmorillonitic, mesic Typic Natraquolls
Fedora	Coarse-loamy, mesic Typic Calciaquolls
Haynie Variant	Coarse-silty, mixed (calcareous), mesic Typic Ustifluvents
Holt	Coarse-loamy, mixed, mesic Typic Argiustolls
*Hurley	Very fine, montmorillonitic, mesic Leptic Natrustolls
*Inavale	Sandy, mixed, mesic Typic Ustifluvents
Jansen	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiustolls
Jerauld	Fine, montmorillonitic, mesic Leptic Natrustolls
Kolls	Very fine, montmorillonitic (calcareous), mesic Vertic Haplaquolls
Labu	Fine, montmorillonitic, mesic Vertic Ustochrepts
Lakoma	Fine, montmorillonitic, mesic Typic Ustochrepts
Mariaville	Loamy, mixed (calcareous), mesic, shallow Typic Ustorthents
Meadin	Sandy, mixed, mesic Entic Haplustolls
Millboro	Fine, montmorillonitic, mesic Vertic Argiustolls
Mosher	Fine, montmorillonitic, mesic Typic Natrustolls
Munjor	Coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents
Okaton	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Ustorthents
O'Neill	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Onita	Fine, montmorillonitic, mesic Pachic Argiustolls
Platte	Sandy, mixed, mesic Mollic Fluvaquents
Promise	Very fine, montmorillonitic, mesic Vertic Haplustolls
Ree	Fine-loamy, mixed, mesic Typic Argiustolls
Reliance	Fine, montmorillonitic, mesic Typic Argiustolls
Sansarc	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Ustorthents
*Scott	Fine, montmorillonitic, mesic Typic Argialbolls
*Tassel	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Valentine	Mixed, mesic Typic Ustipsamments
Vetal	Coarse-loamy, mixed, mesic Pachic Haplustolls
Wendte	Fine, montmorillonitic (calcareous), mesic Vertic Ustifluvents
*Wewela	Fine-loamy, mixed, mesic Typic Argiustolls
Whitelake	Fine-loamy, mixed, mesic Typic Natrustolls
Witten	Fine, montmorillonitic, mesic Vertic Argiustolls

*U.S. GPO: 1984-418-923/10007

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U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

GREGORY COUNTY
SOUTH DAKOTA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Compiled 1983

N

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

LEGEND *

NEARLY LEVEL TO STRONGLY SLOPING, SILTY AND LOAMY SOILS ON UPLANDS

1 — Reliance association: Deep, well drained, nearly level to strongly sloping, silty soils on uplands

2 — Ree association: Deep, well drained, nearly level to moderately sloping, loamy soils on uplands

3 — Agar association: Deep, well drained, nearly level and gently sloping, silty soils on uplands

NEARLY LEVEL TO STEEP, LOAMY SOILS ON UPLANDS

4 — Anselmo-Holt-Tassel association: Deep to shallow, well drained, nearly level to steep, loamy soils on uplands

NEARLY LEVEL TO MODERATELY STEEP, LOAMY SOILS UNDERLAIN BY SAND OR SAND AND GRAVEL, ON UPLANDS

5 — Jansen association: Well drained, nearly level to moderately sloping, loamy soils that are moderately deep over sand, on uplands

6 — Meadin-Jansen association: Excessively drained and well drained, gently sloping to moderately steep, loamy soils that are shallow or moderately deep over sand and gravel, on uplands

NEARLY LEVEL TO STRONGLY SLOPING, CLAYEY SOILS ON UPLANDS

7 — Promise association: Deep, well drained, nearly level and gently sloping, clayey soils on uplands

8 — Miliboro-Boro association: Deep, well drained, nearly level to strongly sloping, clayey soils on uplands

9 — Labu-Promise association: Moderately deep and deep, well drained, moderately sloping and strongly sloping, clayey soils on uplands

STRONGLY SLOPING TO VERY STEEP, CLAYEY AND LOAMY SOILS ON UPLANDS

10 — Labu-Sansarc association: Moderately deep and shallow, well drained, strongly sloping to very steep, clayey soils on uplands

11 — Okaton-Mariaville association: Shallow, well drained, moderately steep to very steep, clayey and loamy soils on uplands

NEARLY LEVEL, CLAYEY AND LOAMY SOILS ON FLOOD PLAINS

12 — Wendte-Haynie Variant association: Deep, moderately well drained and well drained, nearly level, clayey and loamy soils on the flood plains along the Missouri River

* The texture terms in the descriptive headings refer to the surface layer of the major soils in each association.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
GREGORY COUNTY
SOUTH DAKOTA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

N

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

LYMAN COUNTY

CHARLES MIX COUNTY

TRIPP COUNTY

Inset, sheet 3

Inset, sheet 11

Inset, sheet 27

Inset, sheet 42

Inset, sheet 51

Inset, sheet 51

T 100 N

T 99 N

T 98 N

T 97 N

T 96 N

T 95 N

43°20′

43°10′

R 73 W 99°30′

R 72 W 99°20′

R 71 W

R 70 W 99°10′

R 69 W 99°00′

R 68 W

R 67 W 98°50′

R 66 W 98°40′

R 65 W 98°30′

Dixon

Lucas

Dallas

Gregory

BURKE

Herrick

St. Charles

BoneSteel

Fairfax

Lake Burch

Lake Burke

Lake Berry

Fairfax Lake

Star Lake

Case

Fivemile Cr.

Hall Cr.

Dry Cr.

Lake Cr.

Rush Creek

Creek

Trer Cr.

Landing Cr.

Cr.

East Bull Branch

Bull Branch

Cr.

Creek

North Fork

South Fork

Whetstone Creek

Canon Creek

Peters Creek

Ponca Creek

Ponca Cr.

Murphy Creek

Indian Cr.

Fox Cr.

Blue Creek

Squaw Creek

Cr.

Whetstone Cr.

Cr.

Cr.

Mud Cr.

Burnt Rock Cr.

Scalp Creek

North Scalp Cr.

South Scalp Cr.

Cr.

Cr.

Days Cr.

Joe Creek

Randall Creek

Missouri River

Francis Case

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GREGORY COUNTY, SOUTH DAKOTA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lower-case letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded.

SYMBOL	NAME
AaA	Agar silt loam, 0 to 3 percent slopes
AaB	Agar silt loam, 3 to 6 percent slopes
AdC	Anselmo-Dunday complex, 3 to 9 percent slopes
AhB	Anselmo-Holt fine sandy loams, 2 to 6 percent slopes
AhC	Anselmo-Holt fine sandy loams, 6 to 9 percent slopes
AtE	Anselmo-Tassel fine sandy loams, 6 to 25 percent slopes
BaE	Betts loam, 15 to 40 percent slopes
Bb	Bon silt loam
Bc	Bon silt loam, channeled
BlD	Boro-Lakoma silty clays 9 to 15 percent slopes
BmB	Boro-Millboro silty clays, 2 to 6 percent slopes
BmC	Boro-Millboro silty clays, 6 to 9 percent slopes
CaA	Carter-Hurley complex, 0 to 3 percent slopes
CbA	Carter-Promise complex, 0 to 3 percent slopes
Cd	Cass fine sandy loam, channeled
CrC	Coly silt loam, 6 to 9 percent slopes
CrE	Coly silt loam, 9 to 25 percent slopes
DaA	Dunday loamy fine sand, 0 to 3 percent slopes
Du	Durrstein silt loam
Fd	Fedora loam
Ha	Haynie Variant-Munjor complex
HoA	Holt fine sandy loam, 0 to 3 percent slopes
HoB	Holt fine sandy loam, 3 to 6 percent slopes
HoC	Holt fine sandy loam, 6 to 9 percent slopes
HoD	Holt fine sandy loam, 9 to 15 percent slopes
Ia	Inavale loamy sand
JaA	Jansen loam, 0 to 3 percent slopes
JaB	Jansen loam, 3 to 6 percent slopes
JaC	Jansen loam, 6 to 9 percent slopes
JbA	Jansen-Brocksburg loams, 0 to 2 percent slopes
Ko	Kolls clay
LaB	Labu clay, 2 to 6 percent slopes
LaC	Labu clay, 6 to 9 percent slopes
LaD	Labu clay, 9 to 15 percent slopes
LcF	Labu-Sansarc clays, 15 to 50 percent slopes
LoD	Lakoma-Okaton silty clays, 9 to 15 percent slopes
LwB	Lakoma-Wewela complex, 2 to 6 percent slopes
LwC	Lakoma-Wewela complex, 6 to 9 percent slopes
MaD	Mariaville loam, 6 to 15 percent slopes
MaF	Mariaville loam, 15 to 40 percent slopes
MdF	Mariaville-Labu-Anselmo complex, 15 to 40 percent slopes
MeC	Meadin sandy loam, 3 to 9 percent slopes
MeE	Meadin sandy loam, 9 to 25 percent slopes
MoA	Millboro silty clay, 0 to 2 percent slopes
MoB	Millboro silty clay, 2 to 6 percent slopes
MoC	Millboro silty clay, 6 to 9 percent slopes
MpB	Millboro-Lakoma silty clays, 2 to 6 percent slopes
MpC	Millboro-Lakoma silty clays, 6 to 9 percent slopes
Mr	Mosher silt loam
Ms	Mosher Jerauld silt loams
ObE	Okaton-Lakoma silty clays, 15 to 50 percent slopes
OcF	Okaton-Mariaville complex, 15 to 50 percent slopes
OeC	O'Neill fine sandy loam, 3 to 9 percent slopes
On	Onita silt loam
Ot	Onita silt loam, occasionally flooded
Pg	Pits, gravel
Pm	Platte loam
PrA	Promise clay, 0 to 3 percent slopes
PrB	Promise clay, 3 to 6 percent slopes
PrC	Promise clay, 6 to 9 percent slopes
RaA	Ree loam, 0 to 3 percent slopes
RaB	Ree loam, 3 to 6 percent slopes
RaC	Ree loam, 6 to 9 percent slopes
RbA	Ree loam, gravelly substratum, 0 to 2 percent slopes
RcC	Ree-Tassel complex, 3 to 9 percent slopes
ReA	Reliance silty clay loam, 0 to 3 percent slopes
ReB	Reliance silty clay loam, 3 to 6 percent slopes
ReB2	Reliance silty clay loam, 2 to 6 percent slopes, eroded
ReC	Reliance silty clay loam, 6 to 9 percent slopes
ReC2	Reliance silty clay loam, 6 to 9 percent slopes, eroded
ReD	Reliance silty clay loam, 9 to 15 percent slopes
ReD2	Reliance silty clay loam, 9 to 15 percent slopes, eroded
Rv	Riverwash
ScE	Sansarc-Rock outcrop complex, 9 to 40 percent slopes
So	Scott silt loam
TrE	Tassel-Rock outcrop complex, 9 to 30 percent slopes
UlA	Uly silt loam, 0 to 2 percent slopes
UlB	Uly silt loam, 2 to 6 percent slopes
VaC	Valentine loamy fine sand, 3 to 9 percent slopes
VaD	Valentine loamy fine sand, 9 to 18 percent slopes
Vt	Vetal fine sandy loam
Wd	Wendte silty clay
We	Wendte silty clay, channeled
Wh	Whitelake fine sandy loam
Wh	Witten silty clay

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Hedley Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS (GnB, WaC2)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot

2 215 000 FEET

R. 73 W.

430 000 FEET

LYMAN COUNTY

T. 100 N.

TRIPP COUNTY

(Joins sheet 2)

(Joins sheet 4)

2 235 000 FEET

420 000 FEET

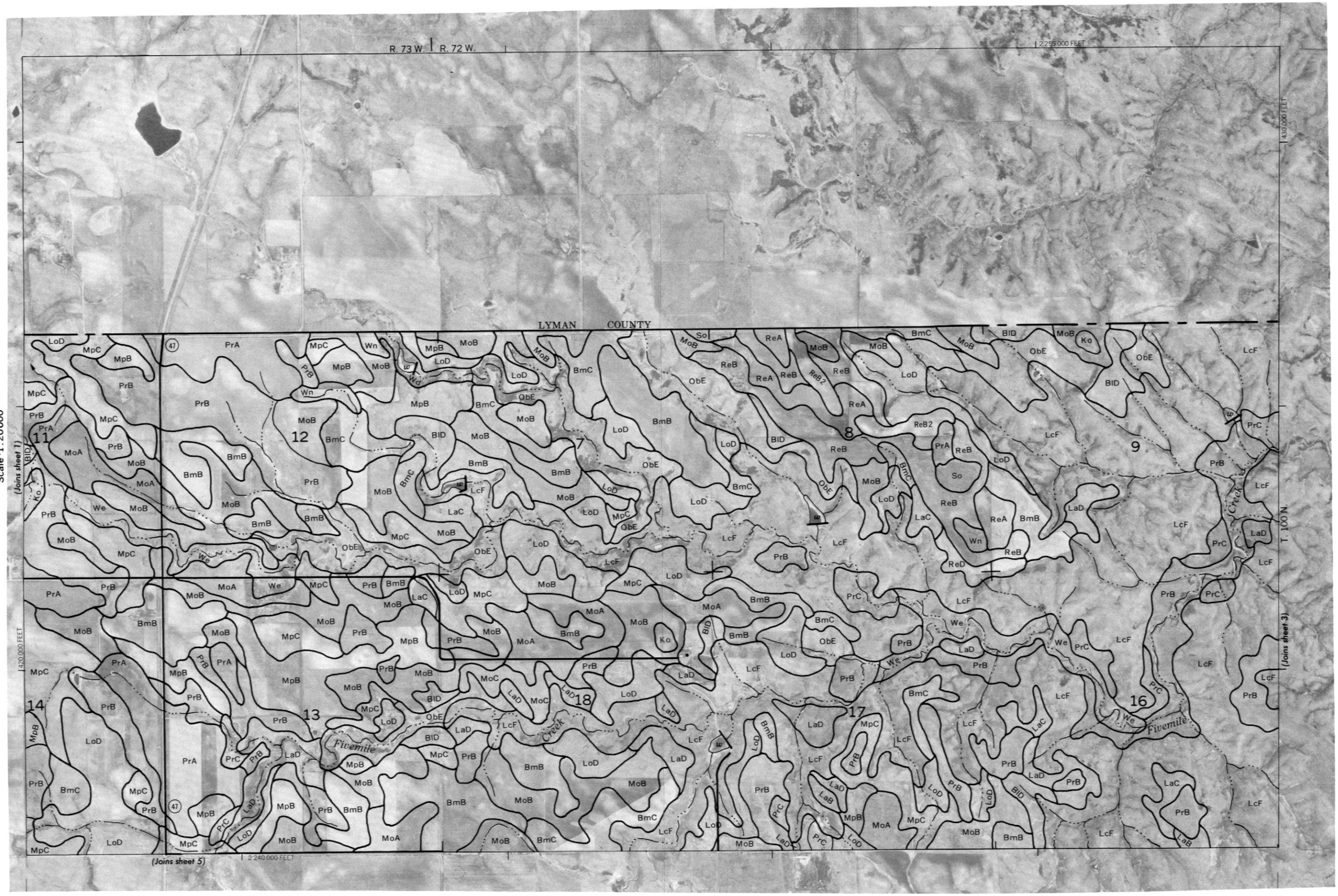
Fivemile Creek

N

1 Mile

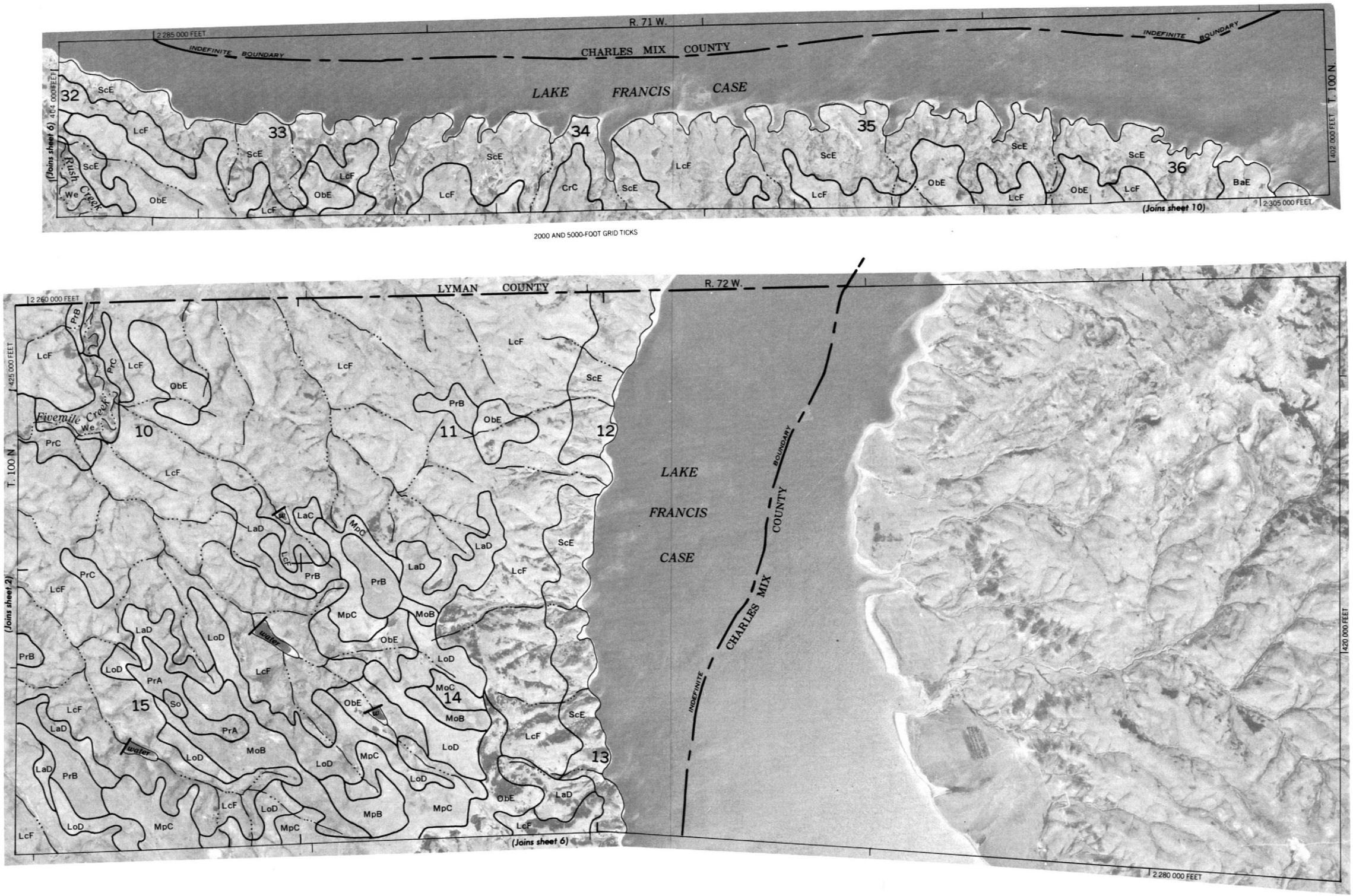
5000 Feet

Scale 1:20000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 3



3

N

1 Mile

5000 Feet

0 0

Scale 1:20000

1 1/4 1/2 3/4 1

5000 4000 3000 2000 1000 0

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 4

4

N

1 Mile

5000 Feet

0 0

Scale 1:20000

1/4 1000

1/2 2000

3/4 4000

1 5000

TRIPP COUNTY

(Joins sheet 1)

R. 73 W.

2 235 000 FEET

415 000 FEET

T. 100 N.

405 000 FEET

2 215 000 FEET

(Joins sheet 7)

(Joins sheet 5)

BUFFALO BUTTES

Bull Creek

Bull Creek

19 20 21 22 23

30 29 28 27 26

31 32 33 34 35

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 5

5

N

R. 73 W. R. 72 W.

T. 100 N.

2 240 000 FEET

415 000 FEET

405 000 FEET

2 255 000 FEET

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 8)

Dry Creek

Scale 1:20000

1 Mile

5000 Feet

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GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 6

6

N

Scale · 1:20000

1 Mile 5000 Feet

0 ¼ ½ ¾ 1

(Joins sheet 3)

(Joins sheet 5)

(Joins sheet 9)

(Joins inset, sheet 9)

R. 72 W. | R. 71 W.

2 280 000 FEET

2 260 000 FEET

415 000 FEET

405 000 FEET

T. 100 N.

INDEFINITE BOUNDARY

LAKE CHARLES MIX COUNTY

FRANCIS CASE

INDEFINITE BOUNDARY

Dry Creek

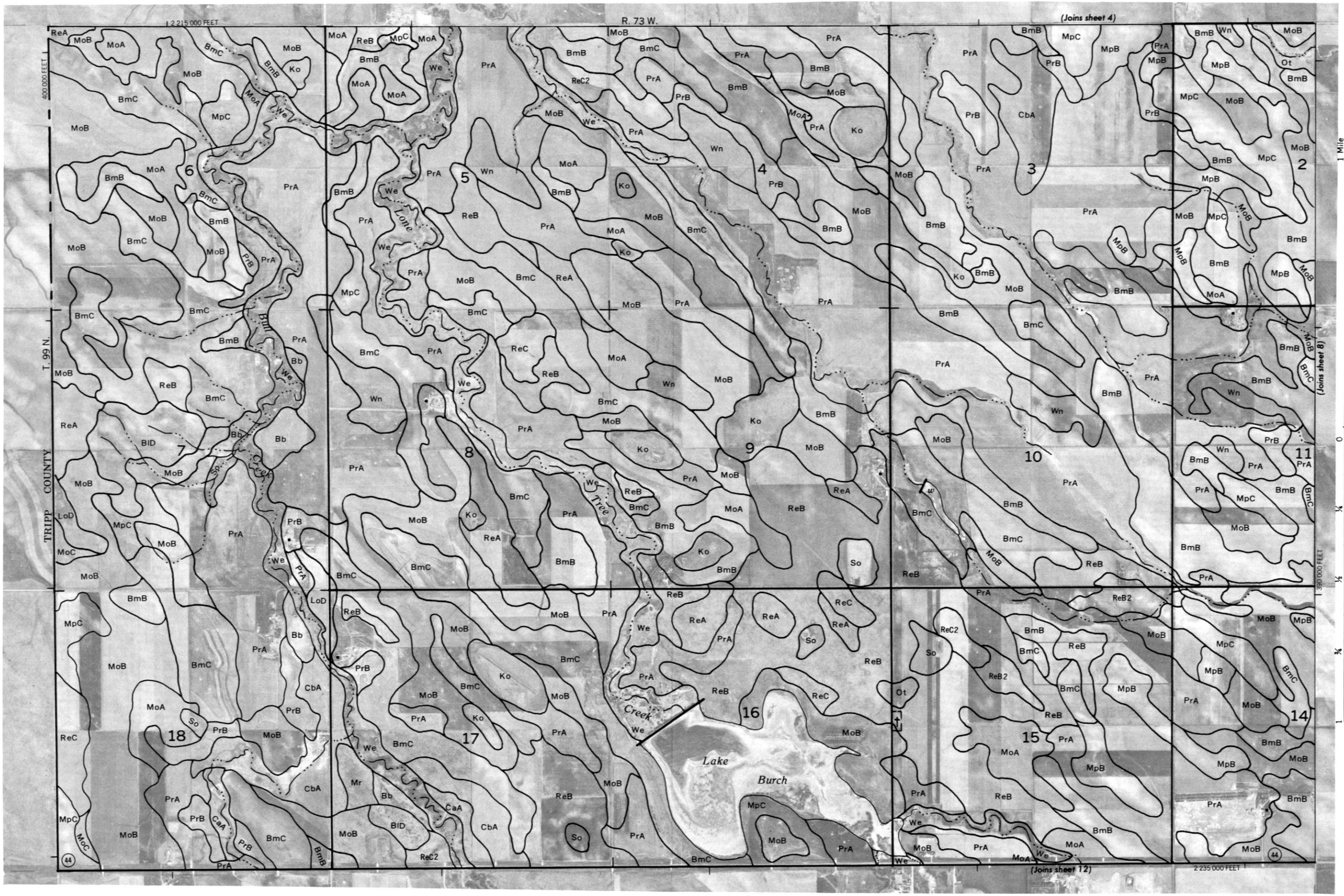
Lanaing Creek

Rush Creek

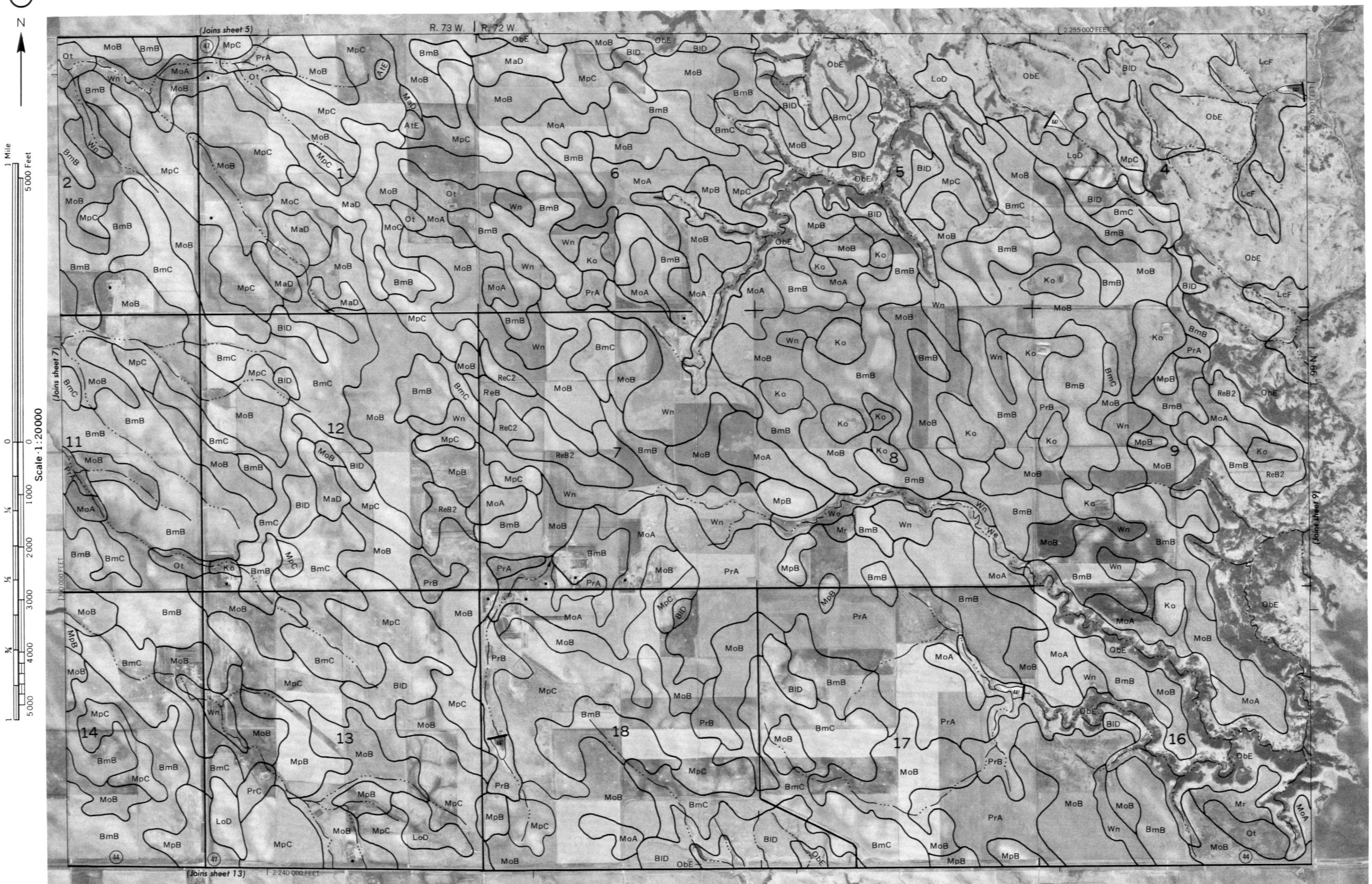
22 23 24 25 26 27 30 31 32 34 35 36

LaD LaC LcF LoD MpB MpC MaF ObE ReB ReC ReC2 BlD ScE PrA PrB PrC We

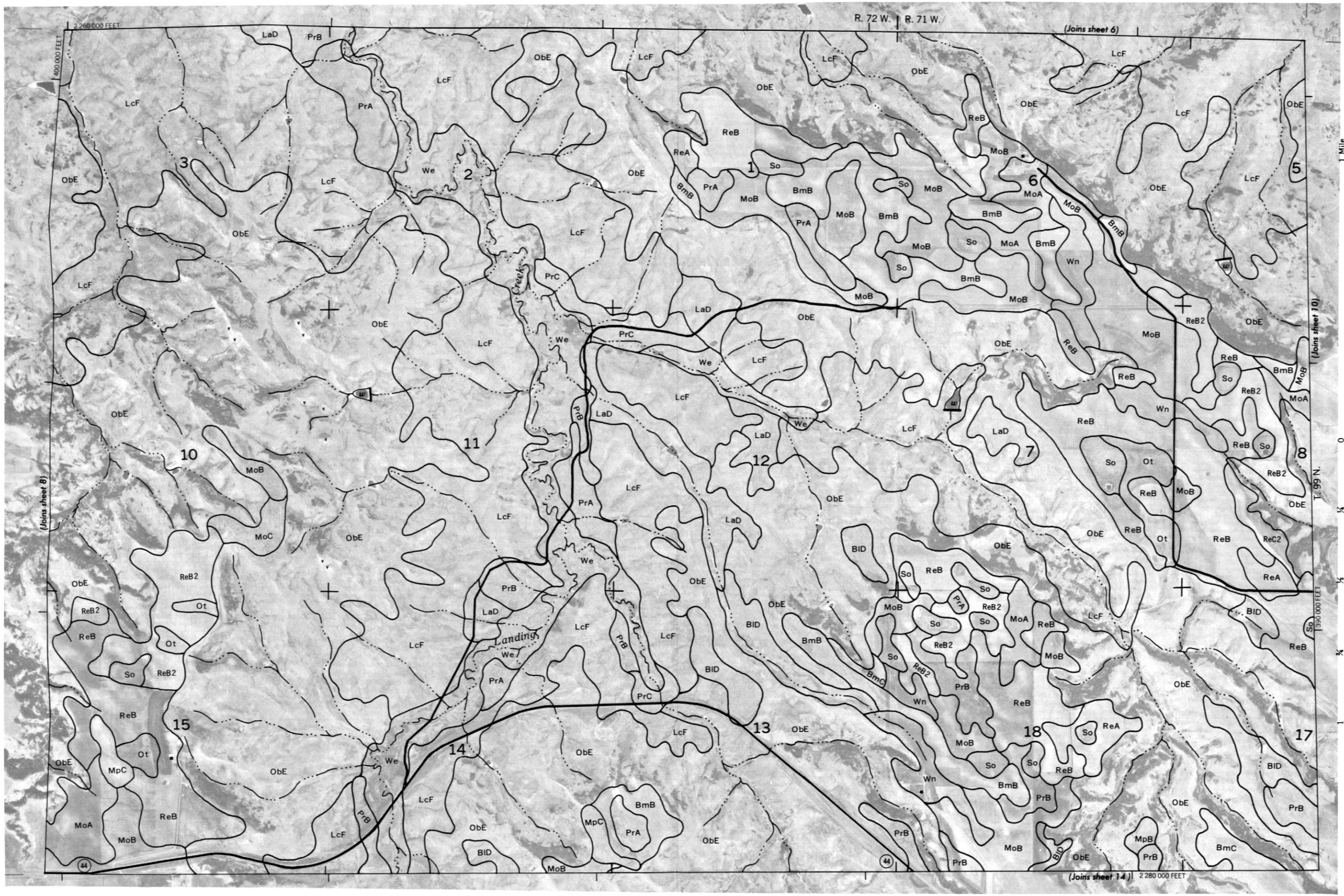
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 8



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 10

10

N

Scale · 1:20000

1 Mile 5000 Feet

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

1½ 5000

T. 99 N.

R. 71 W.

(Joins inset, sheet 3)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 15)

2 305 000 FEET

2 285 000 FEET

400 000 FEET

390 000 FEET

Rush Creek

Rush Creek

LAKE

FRANCIS

CASE

water

5 4 3 2 1

8 9 10 11 12

17 16 15 14 13

ObE LcF BID LaD We PrC PrB ScE CrE BmC BmB MoB MoA ReB2 ReA ReC ReD LoD MaF MpC So Ot UlB BaE

44

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 310 000 FEET R. 70 W. 2 338 000 FEET

400 000 FEET

365 000 FEET

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

LAKE

FRANCIS

CASE

T. 99 N.

T. 98 N.

390 000 FEET

355 000 FEET

2 315 000 FEET

2 333 000 FEET

(Joins sheet 10)

(Joins sheet 16)

(Joins sheet 21)

(Joins sheet 27)

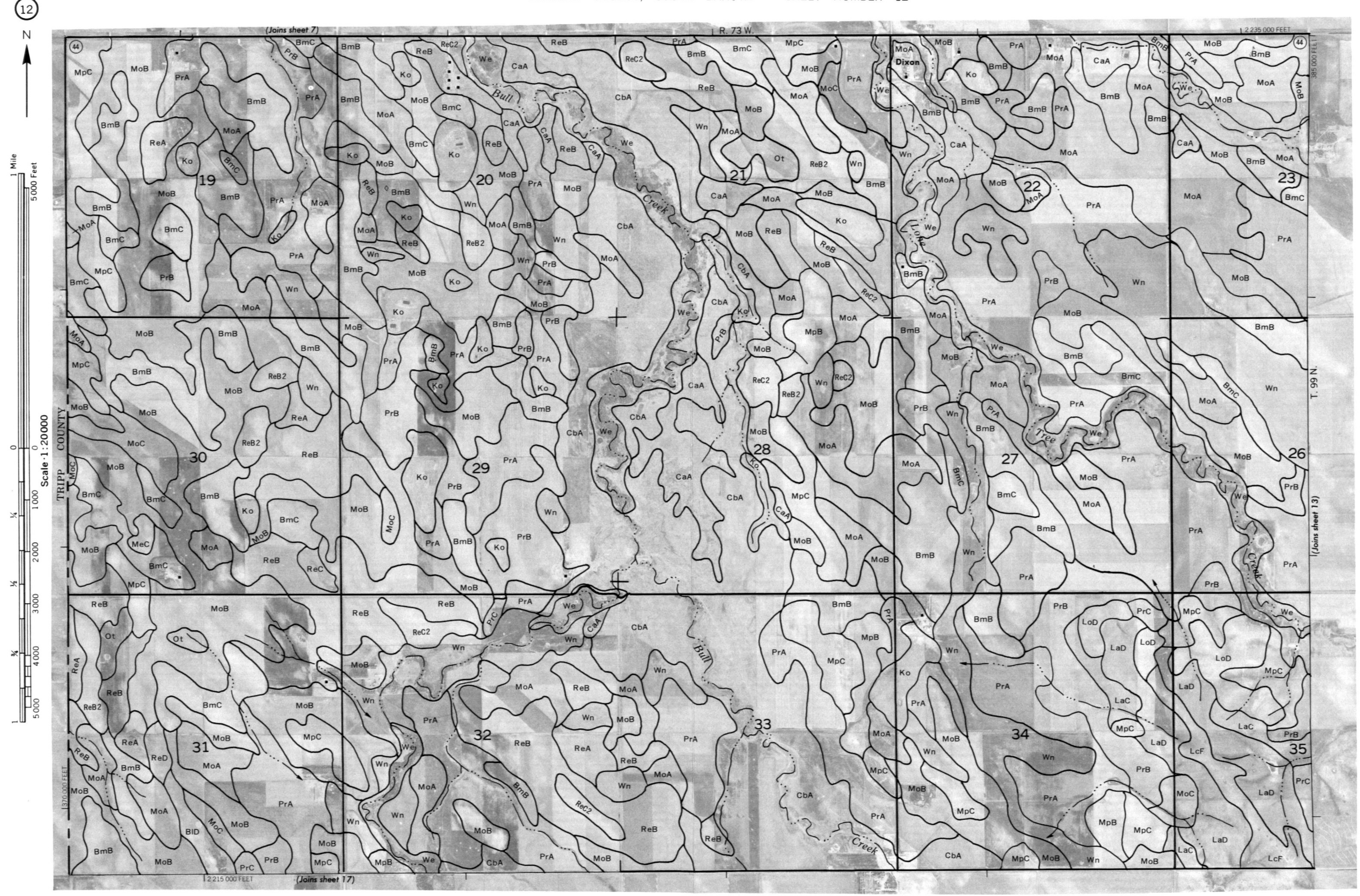
BaE, UlB, Pg, ObE, We, MeE, CrE, BlD, PrB, LcF, LaD, Wn, ReB, MaF, MoB, LoD

6, 7, 8, 11, 12, 13, 14, 17, 18

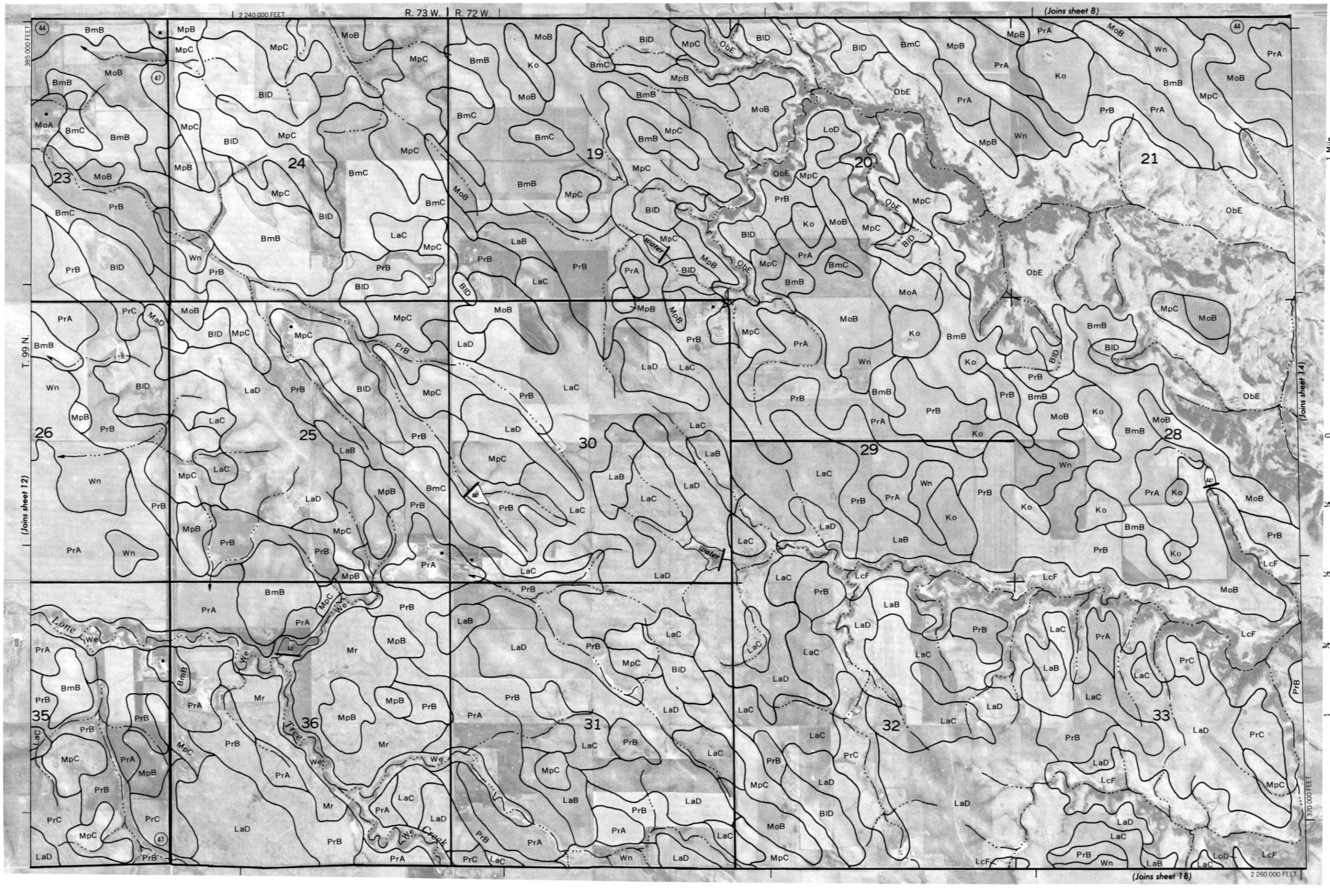
N

1 Mile 5000 Feet

Scale 1:20000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



14

N

1 Mile
5000 Feet
Scale · 1 : 20000

R. 72 W. | R. 71 W.

T. 99 N.

2 280 000 FEET

385 000 FEET

(Joins sheet 9)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 19)

2 265 000 FEET

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 15

15

N

R. 71 W.

T. 99 N.

2 285 000 FEET

385 000 FEET

(Joins sheet 10)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

2 305 000 FEET

370 000 FEET

Rush Creek

20 21 22 23 24 25 26 27 28 29 32 33 34 35 36

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:20000

1 Mile 5000 Feet

R. 70 W.

(Joins sheet 11)

(Joins sheet 15)

(Joins sheet 21)

T. 99 N.

2 330 000 FEET

385 000 FEET

370 000 FEET

2 310 000 FEET

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

LAKE

FRANCIS

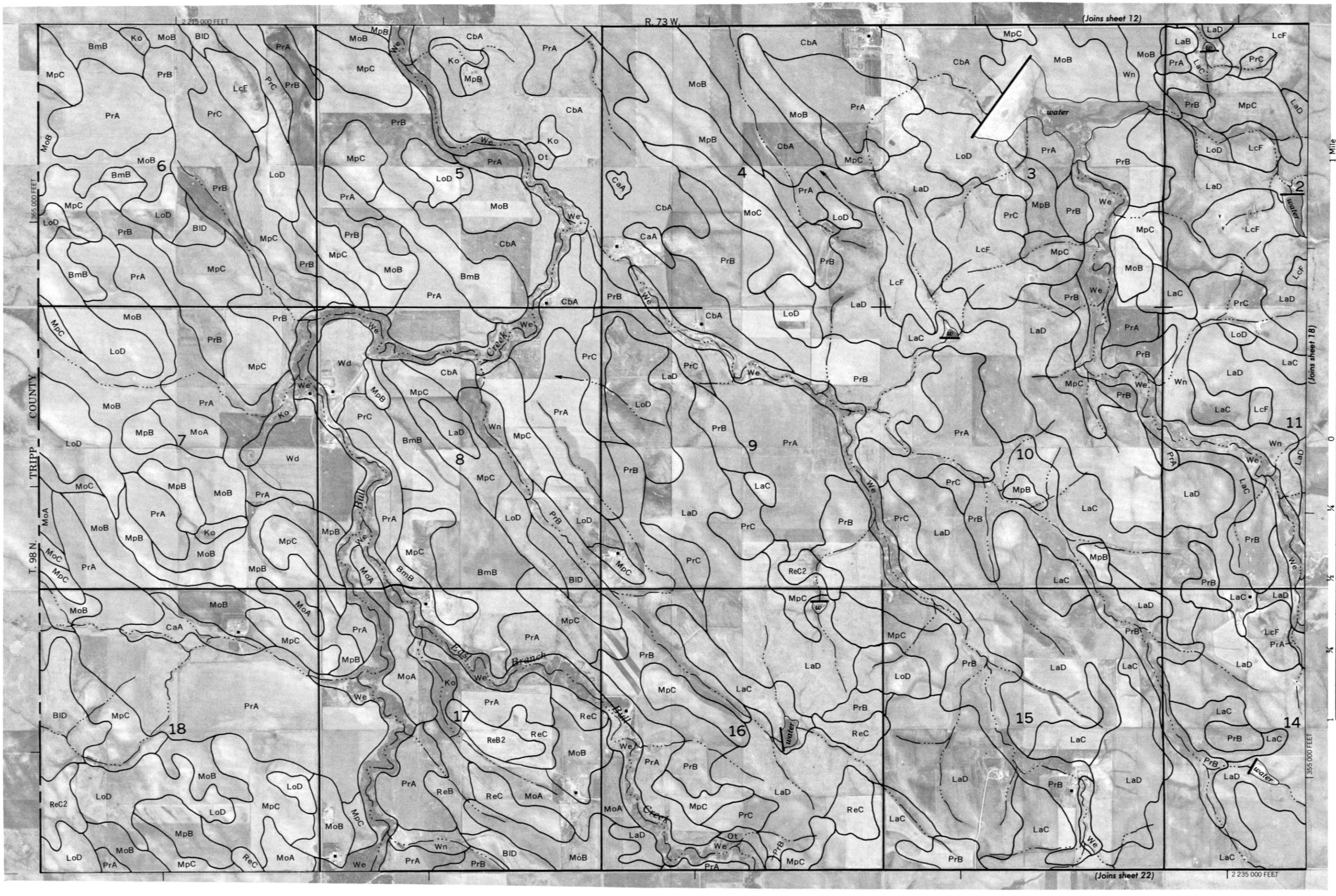
CASE

INDEFINITE BOUNDARY

19 20 21 27 28 29 30 31 32 33 34 35

LcF ObE PrB LaD MoB MoA MaF Ot ReB2 So ReA ReB BaE UlB

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



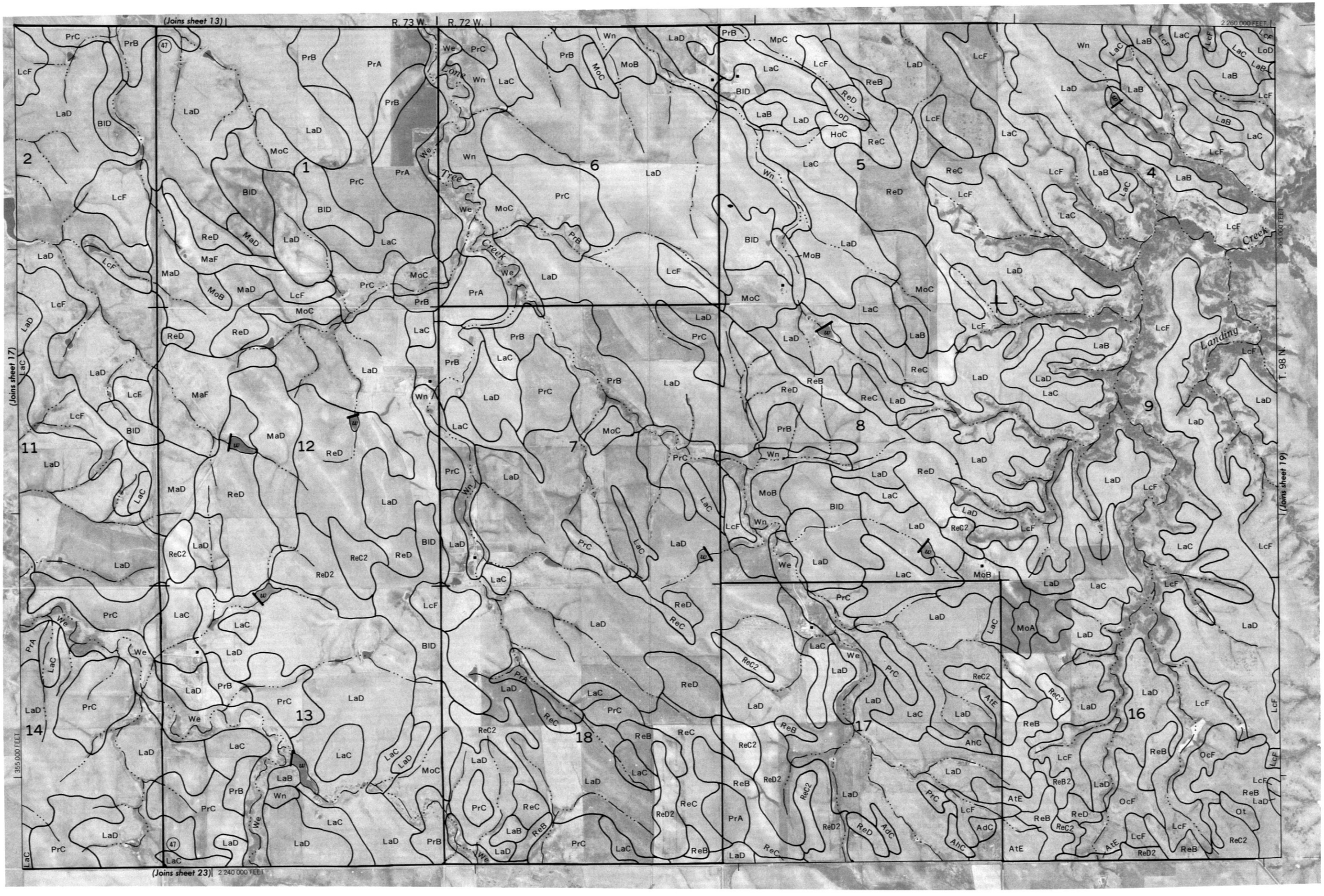
18

N

Scale 1:20000

1 Mile 5000 Feet

0 0 1/4 1000 1/2 2000 3/4 3000 1 4000 5000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

R. 72 W. | R. 71 W.

2 265 000 FEET

(Joins sheet 14)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 24)

2 280 000 FEET

355 000 FEET

T. 98 N.

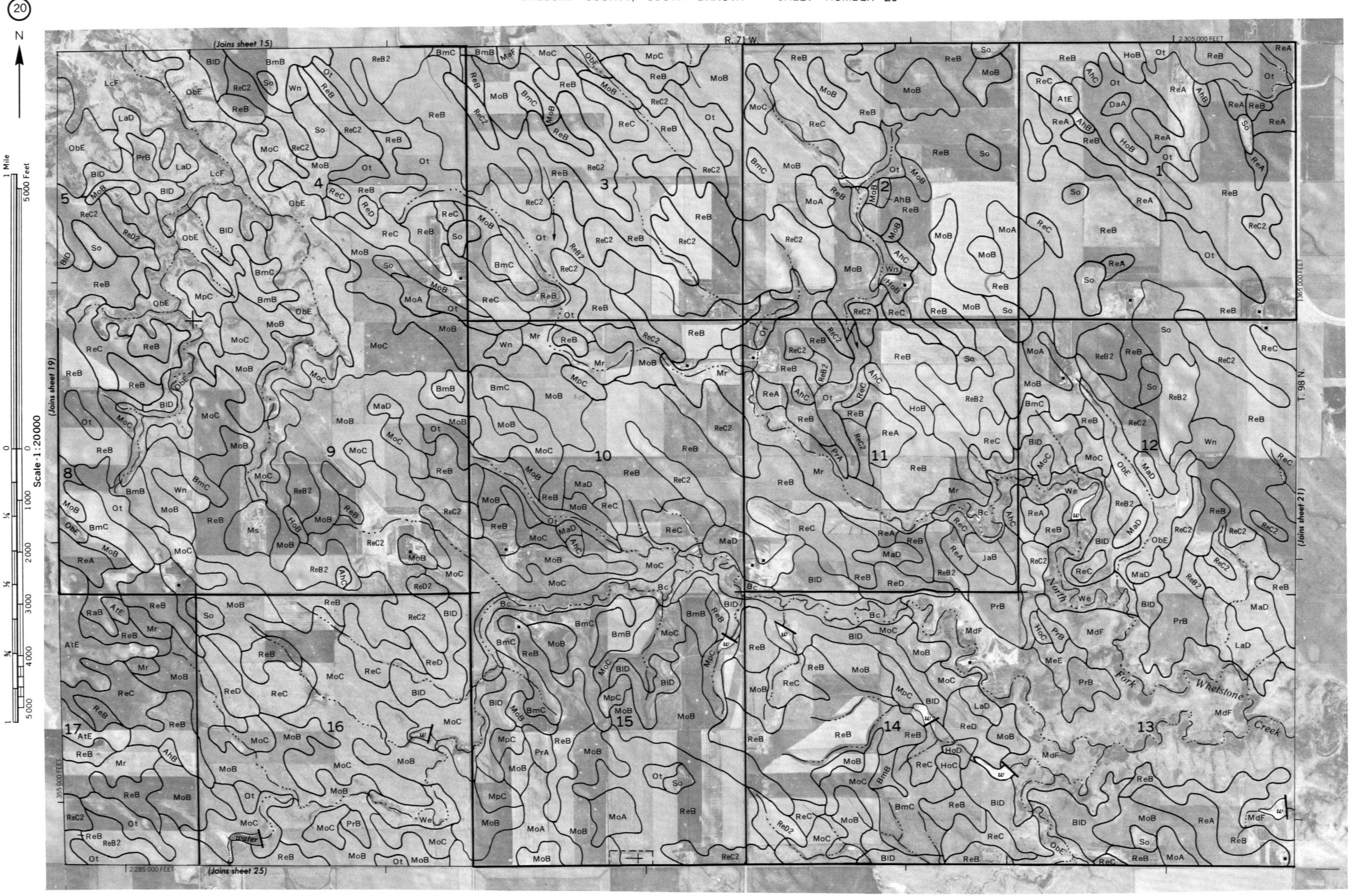
Landing Creek

Landing Creek

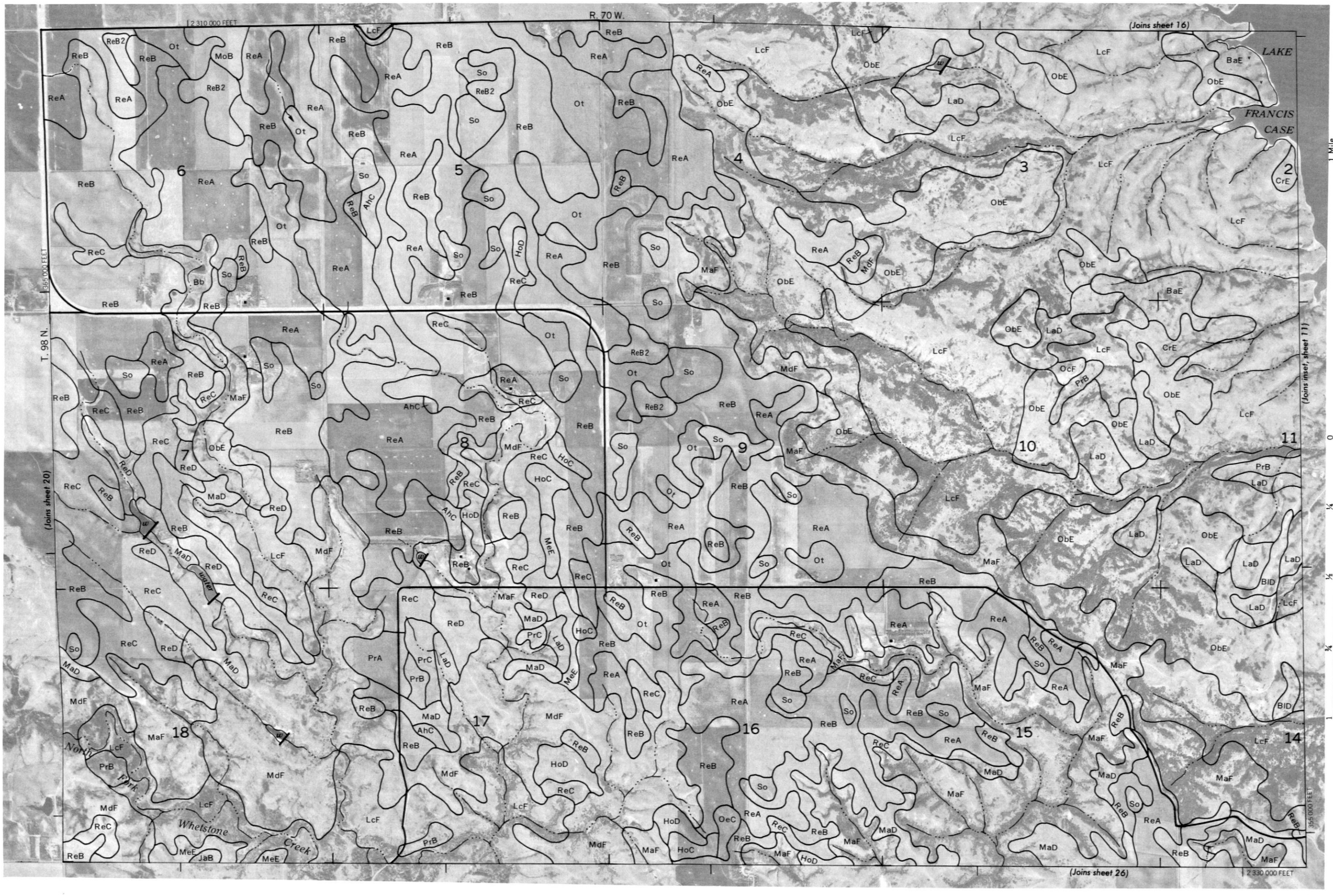
1 Mile

5000 Feet

Scale 1:20000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



22

N

(Joins sheet 17)

R. 73 W.

2 235 000 FEET

1 Mile
5000 Feet
Scale · 1:20000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

TRIPP COUNTY

T. 98 N.

2 350 000 FEET

2 340 000 FEET

2 215 000 FEET

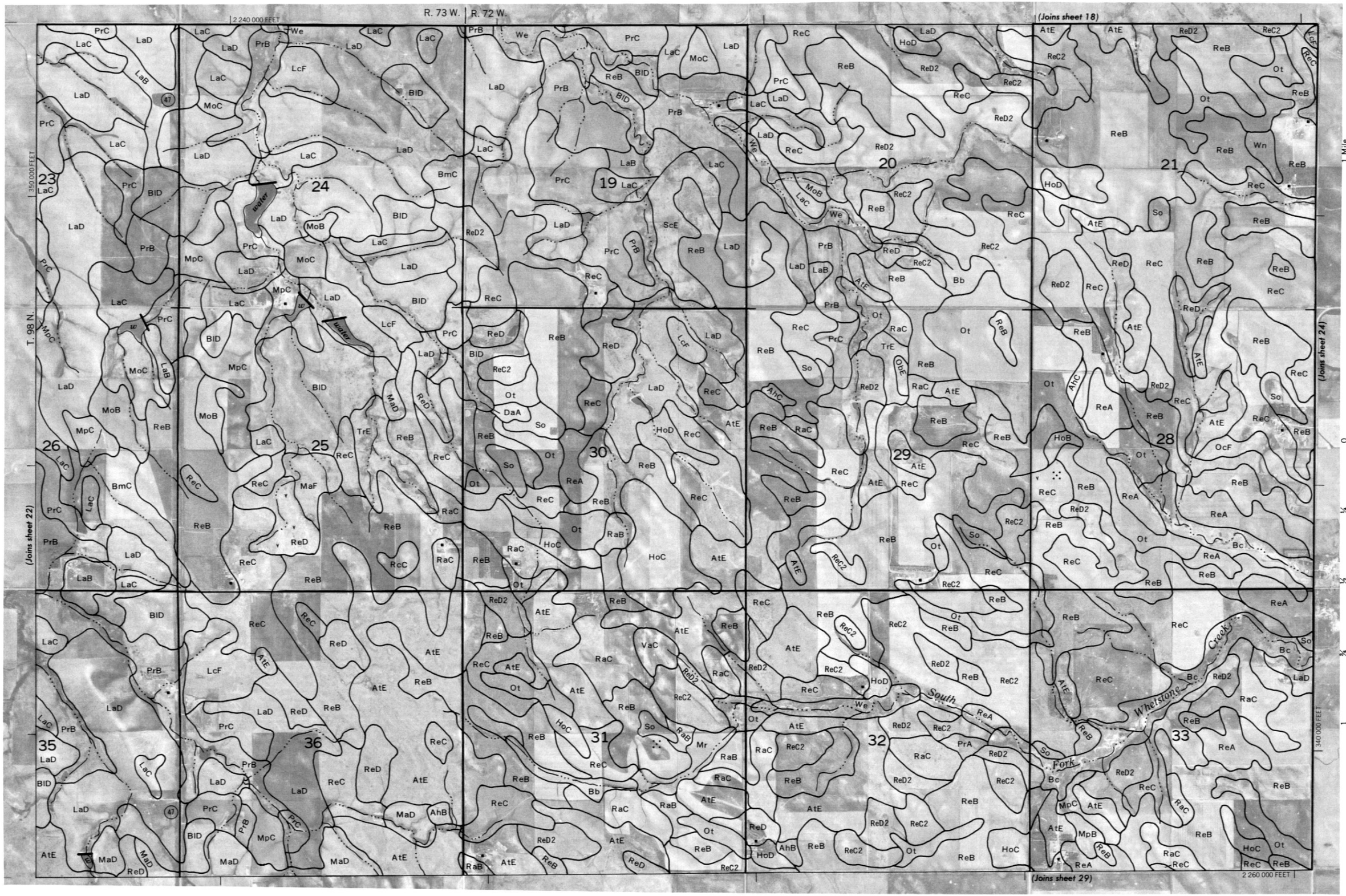
(Joins sheet 28)

(Joins sheet 23)

19 20 21 22 23 30 29 28 27 26 31 32 33 34 35

Bull Creek · Bull Creek · Bull Creek · East Branch Wn. · Water

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 23



23

N

1 Mile

5000 Feet

Scale 1:20000

0 0 1000 2000 3000 4000 5000

¼ ½ ¾ 1

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(24)

N

1 Mile
5000 Feet
0
0
Scale 1:20000
1/4 1000
1/2 2000
3/4 4000
1 5000

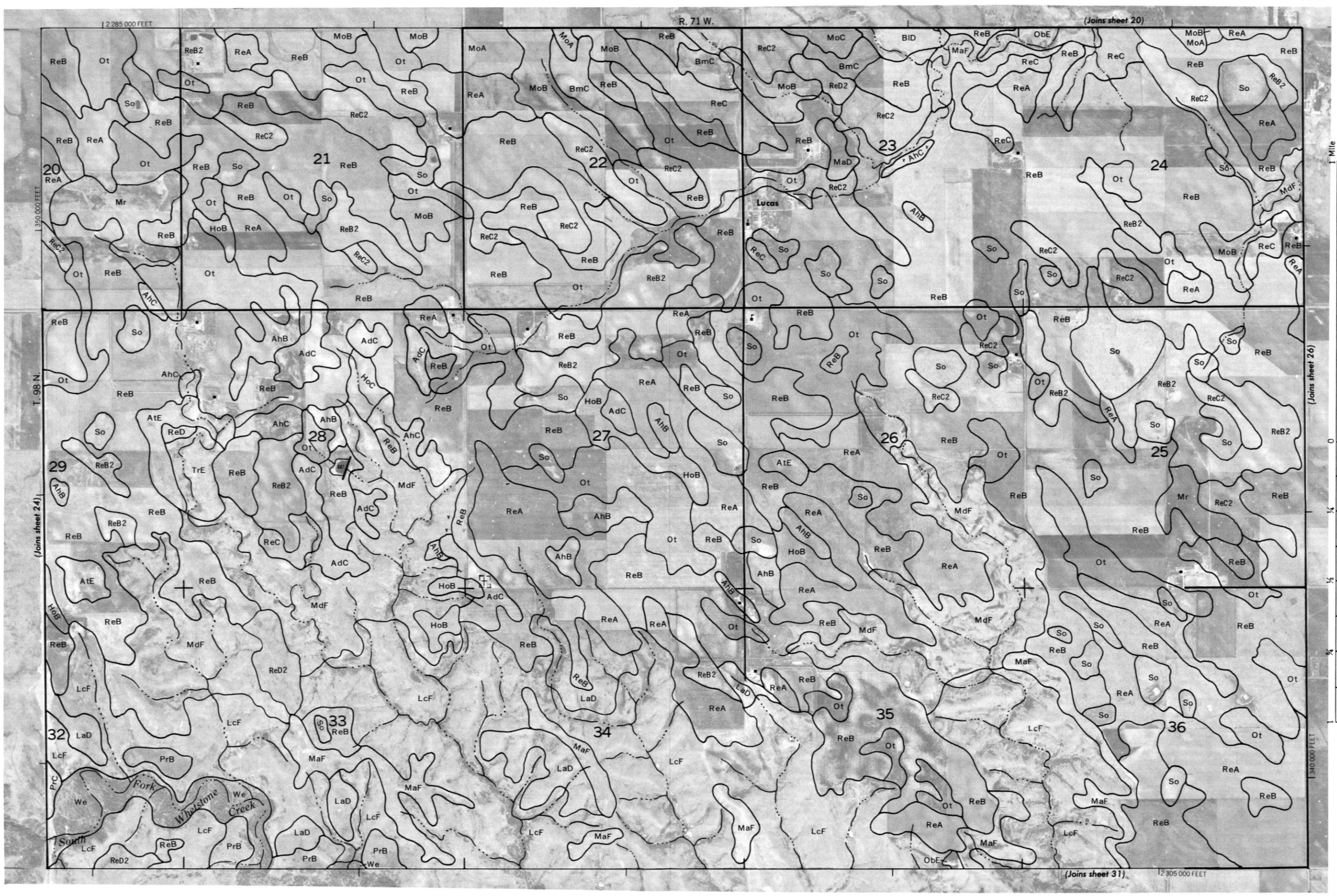
R. 72 W.
R. 71 W.
2 280 000 FEET
350 000 FEET
T. 98 N.
2 265 000 FEET
340 000 FEET

(Joins sheet 19)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 30)

22 23 24 19 20
27 26 25 30 29
34 35 36 31 32

South Fork Whetstone Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



(26)

N

1 Mile 5000 Feet

Scale · 1 : 20000

0 0 1000 ¼ 2000 ½ 3000 ¾ 4000 1 5000

R. 70 W.

2 330 000 FEET

340 000 FEET

T. 98 N.

2 310 000 FEET

(Joins sheet 21)

(Joins sheet 25)

(Joins sheet 32)

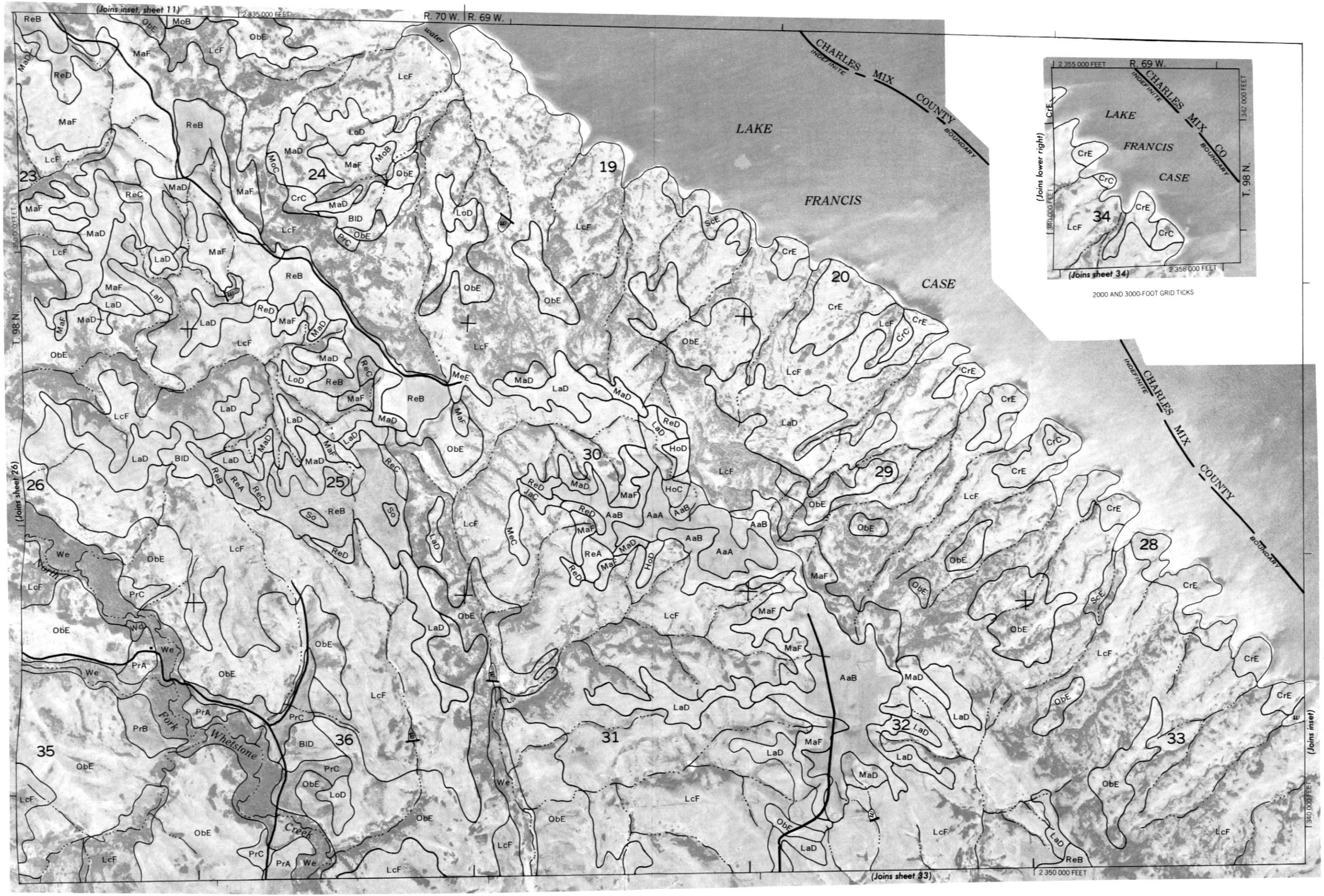
(Joins sheet 27)

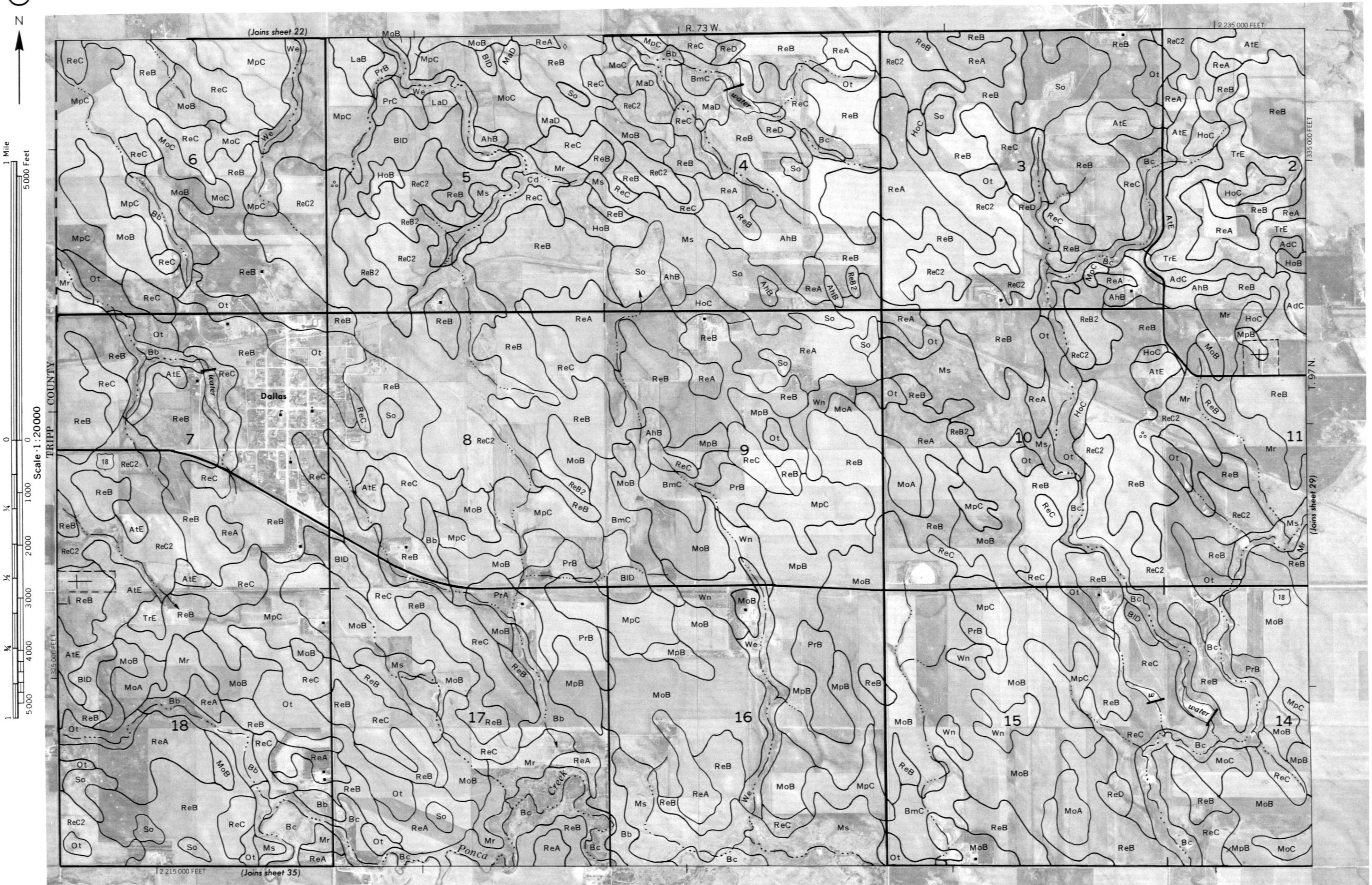
North Fork Whetstone Creek

19 20 21 22 23 30 29 28 27 26 31 32 33 34 35

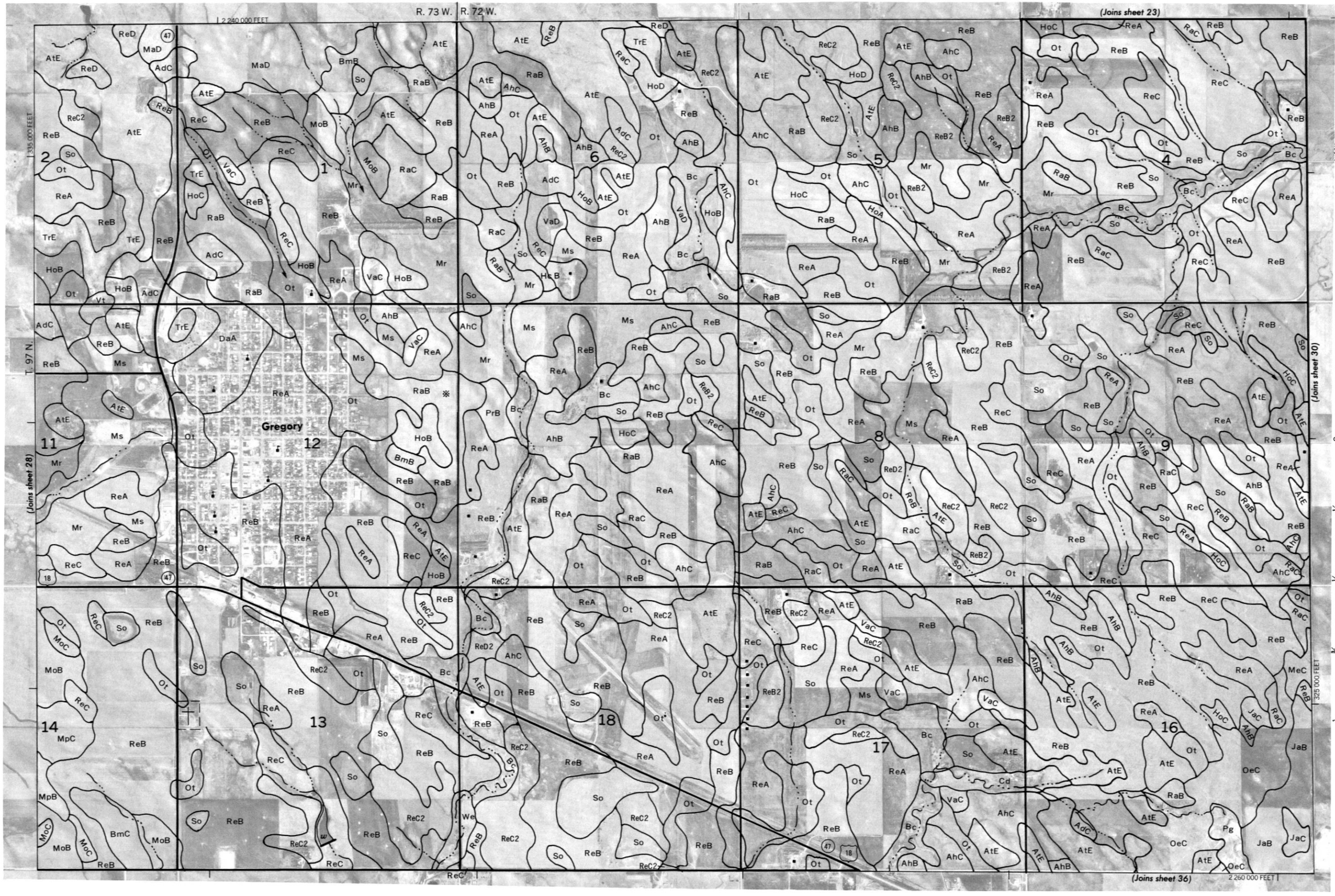
ReB ReA ReC ReC2 ReD2 ReB2 JaB MeC MeE MdF MdF LcF MaF MaD HoD PrB So Ot We MpC ObE MoB LaD PrC AhC AhB

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid (cks and land division corners, if shown, are approximately positioned.





This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 30

30

N

1 Mile
5000 Feet

0 0 Scale 1:20000

¼ 1000
½ 2000
¾ 3000
1 4000
5000

325 000 FEET

R. 72 W.
R. 71 W.

2 280 000 FEET

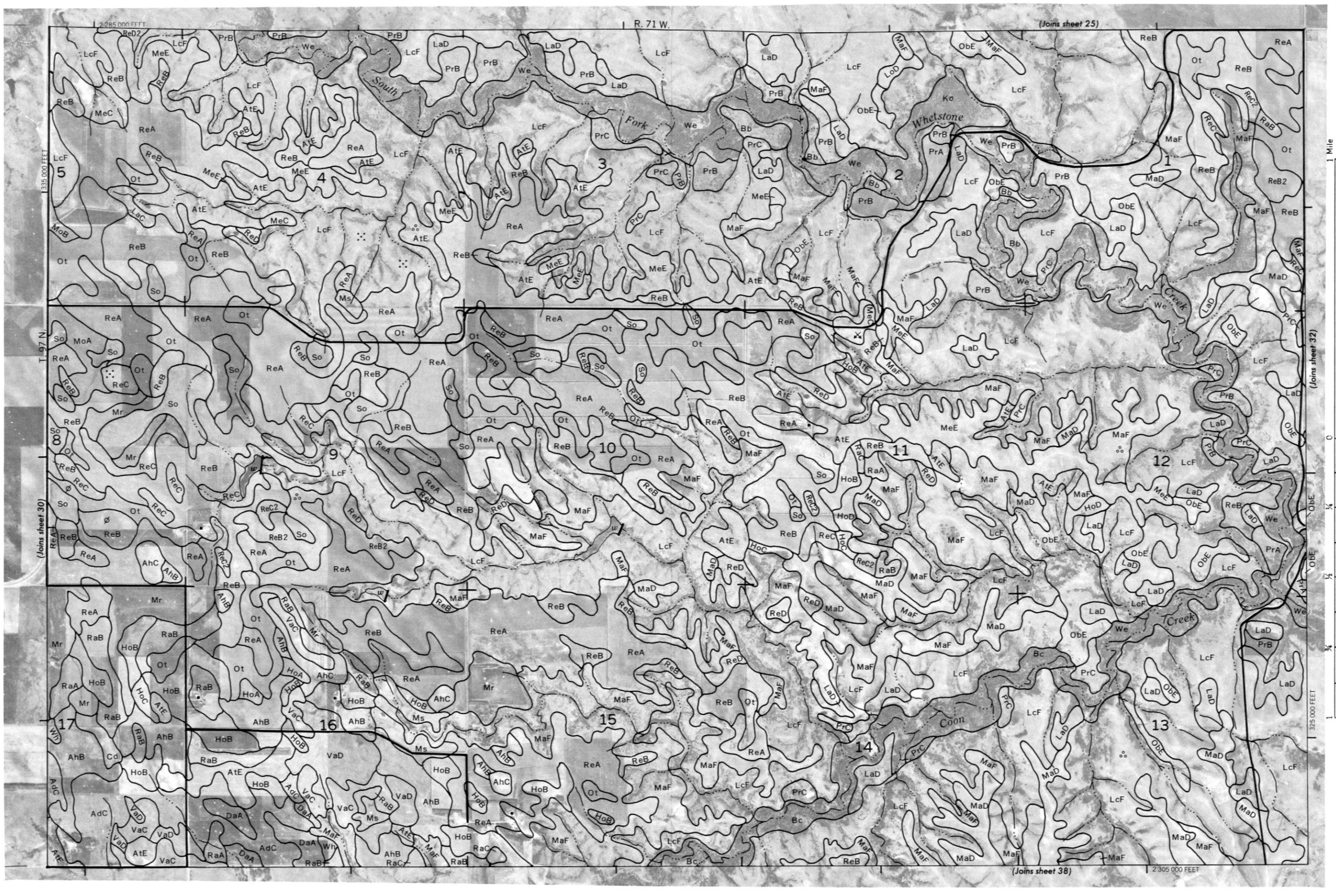
335 000 FEET

T. 97 N.

(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 37)

2 265 000 FEET

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



32

N

Scale · 1:20000

1 Mile

5000 Feet

(Joins sheet 26)

R. 70 W.

2 330 000 FEET

335 000 FEET

T. 97 N.

(Joins sheet 31)

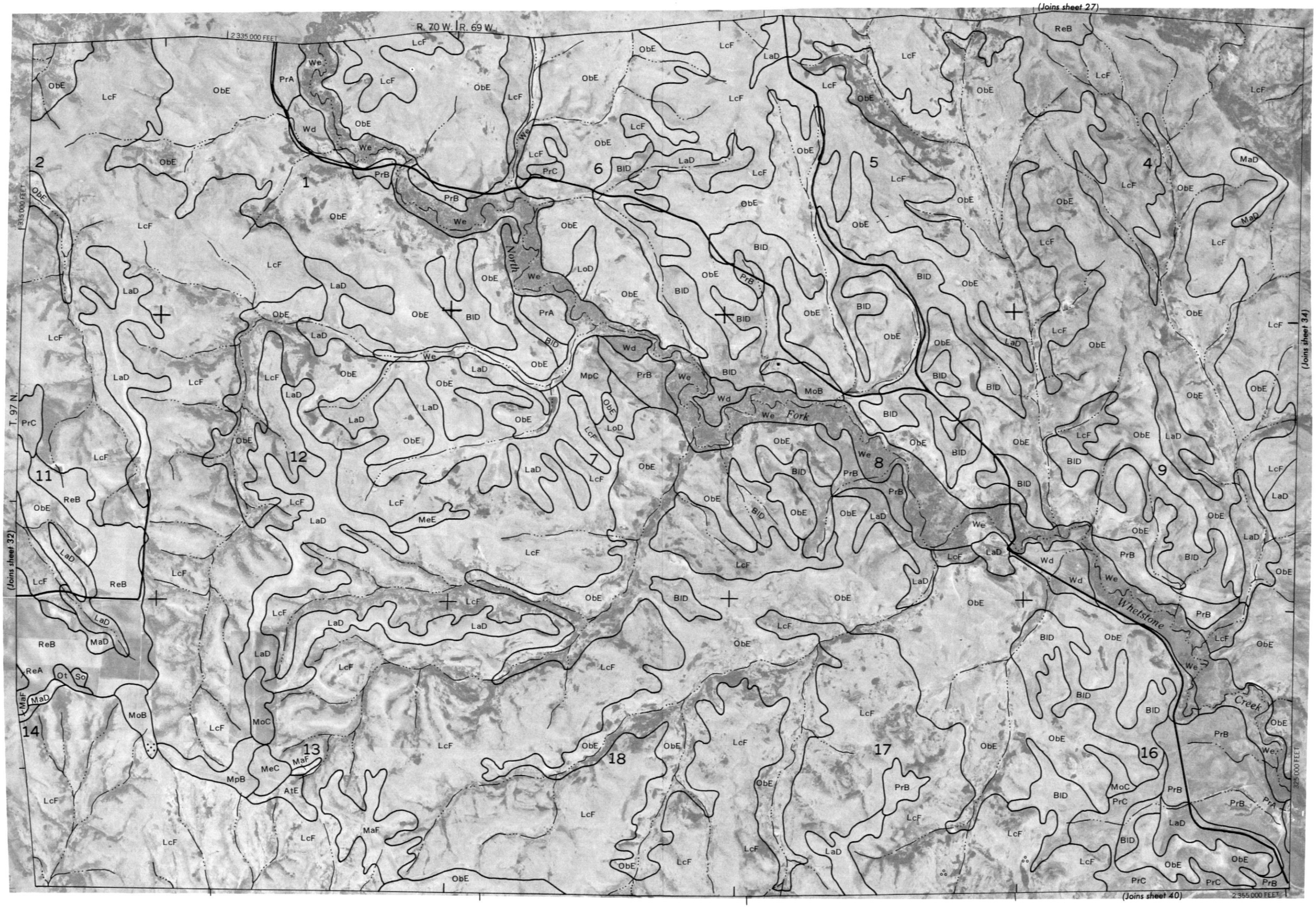
(Joins sheet 33)

325 000 FEET

2 310 000 FEET

(Joins sheet 39)

South Fork Whetstone Creek



N

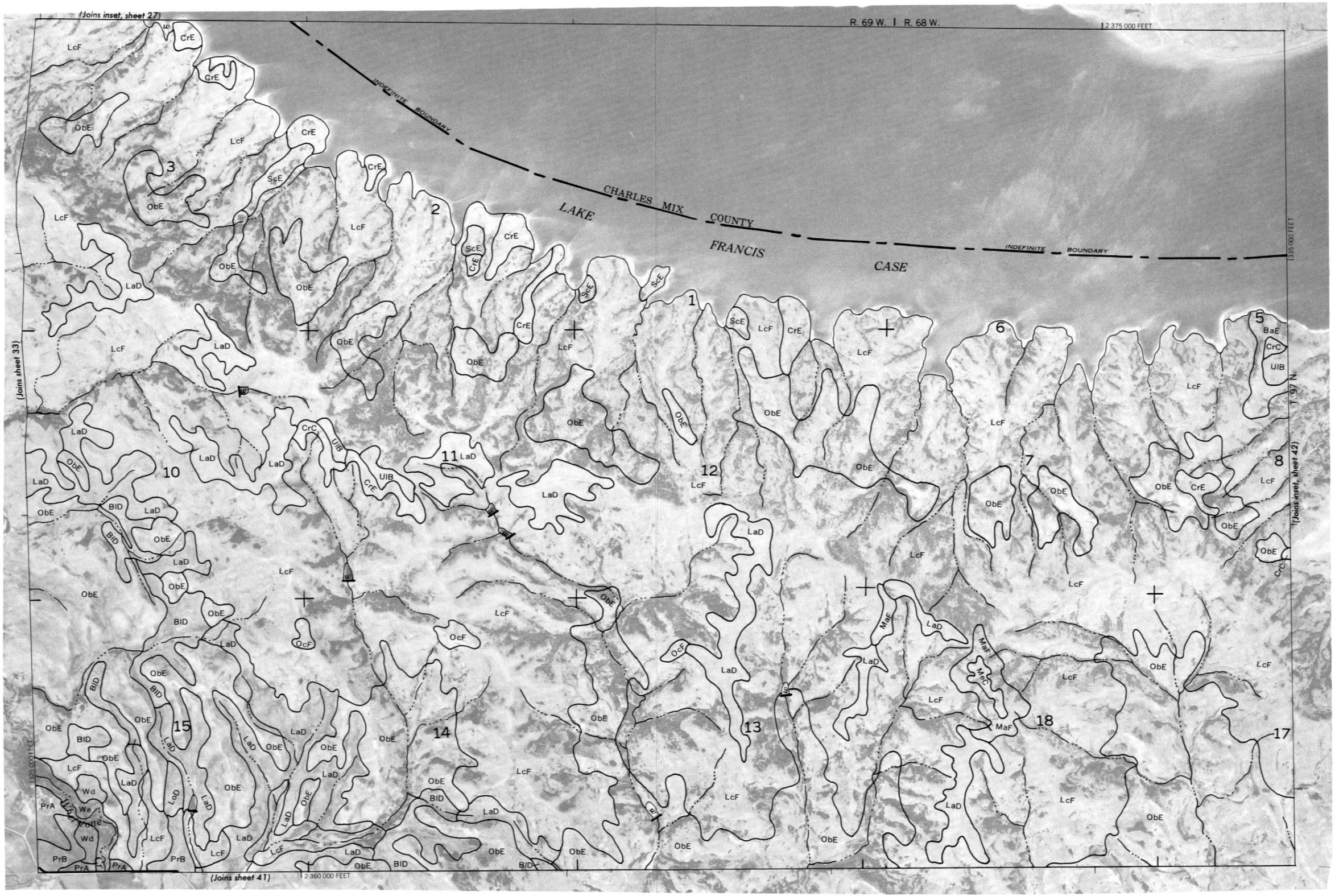
1 Mile
5000 Feet

Scale 1:20000

34

N

1 Mile
5000 Feet
Scale 1:20000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 35

35

N

2 215 000 FEET

R. 73 W.

(Joins sheet 28)

320 000 FEET

T. 97 N.

TRIPP COUNTY

(Joins sheet 36)

310 000 FEET

(Joins sheet 43)

2 235 000 FEET

1 Mile

5000 Feet

Scale 1:20000

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(36)

N

R. 72 W. | R. 73 W.

(Joins sheet 29)

2 260 000 FEET

320 000 FEET

1 Mile

5 000 Feet

Scale · 1 : 20 000

0 1000 2000 3000 4000 5000

1/4 1/2 3/4

310 000 FEET

2 240 000 FEET

(Joins sheet 35)

(Joins sheet 44)

(Joins sheet 37)

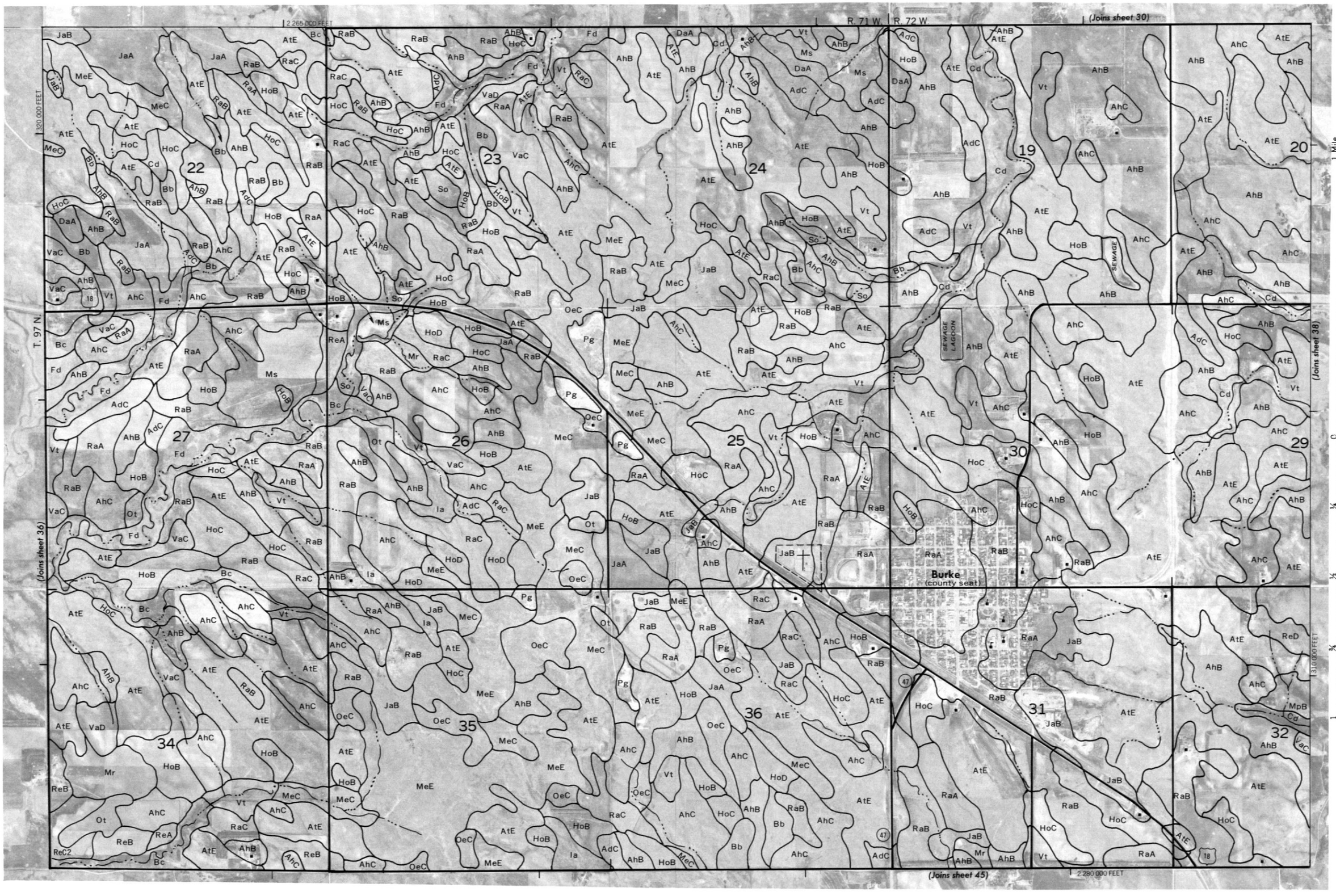
23 24 19 20 21

26 25 30 29 28

35 36 31 32 33

SEWAGE LAGOON

Ponca Creek



38

N

1 Mile
5000 Feet

Scale 1:20000

(Joins sheet 31)

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 46)

R. 71 W.

T. 97 N.

2 305 000 FEET

320 000 FEET

310 000 FEET

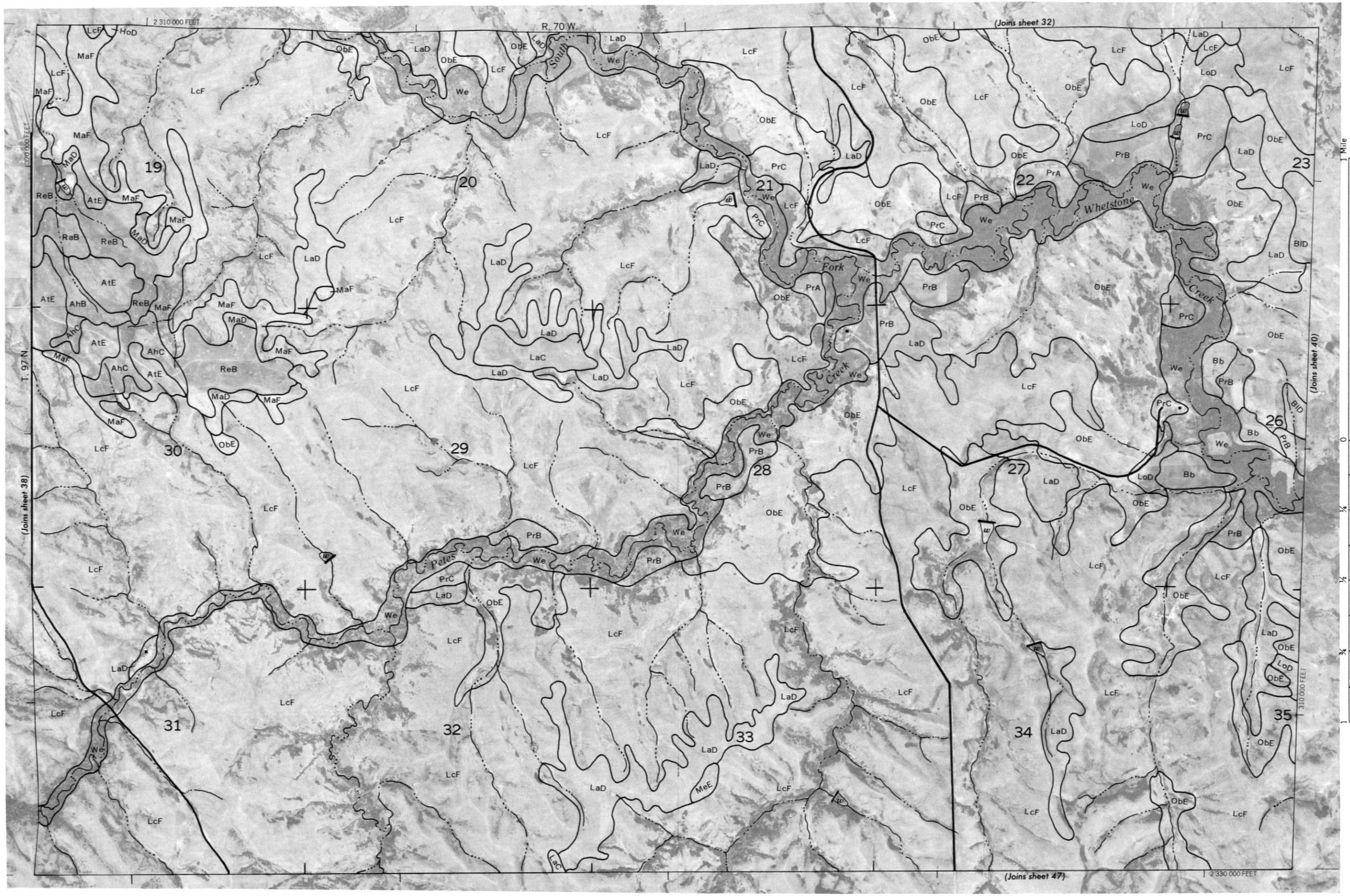
2 285 000 FEET

Coon Creek

Lake Burke

Pease Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



(40)

N

1 Mile

5000 Feet

Scale 1:20000

R. 70 W. | R. 69 W.

(Joins sheet 33)

2 355 000 FEET

320 000 FEET

T. 97 N.

(Joins sheet 39)

(Joins sheet 41)

310 000 FEET

2 335 000 FEET

(Joins sheet 48)

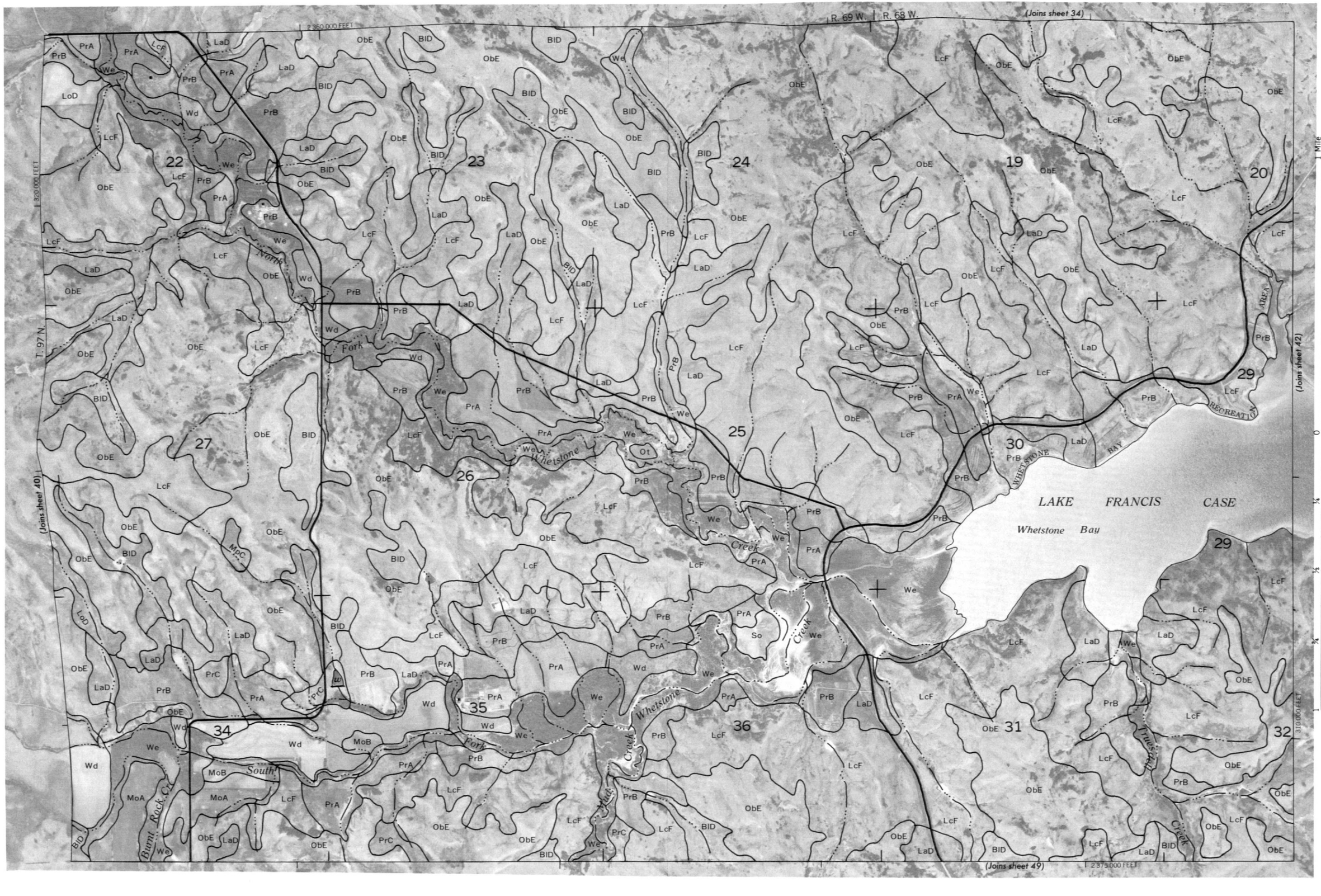
South Fork Sand Creek

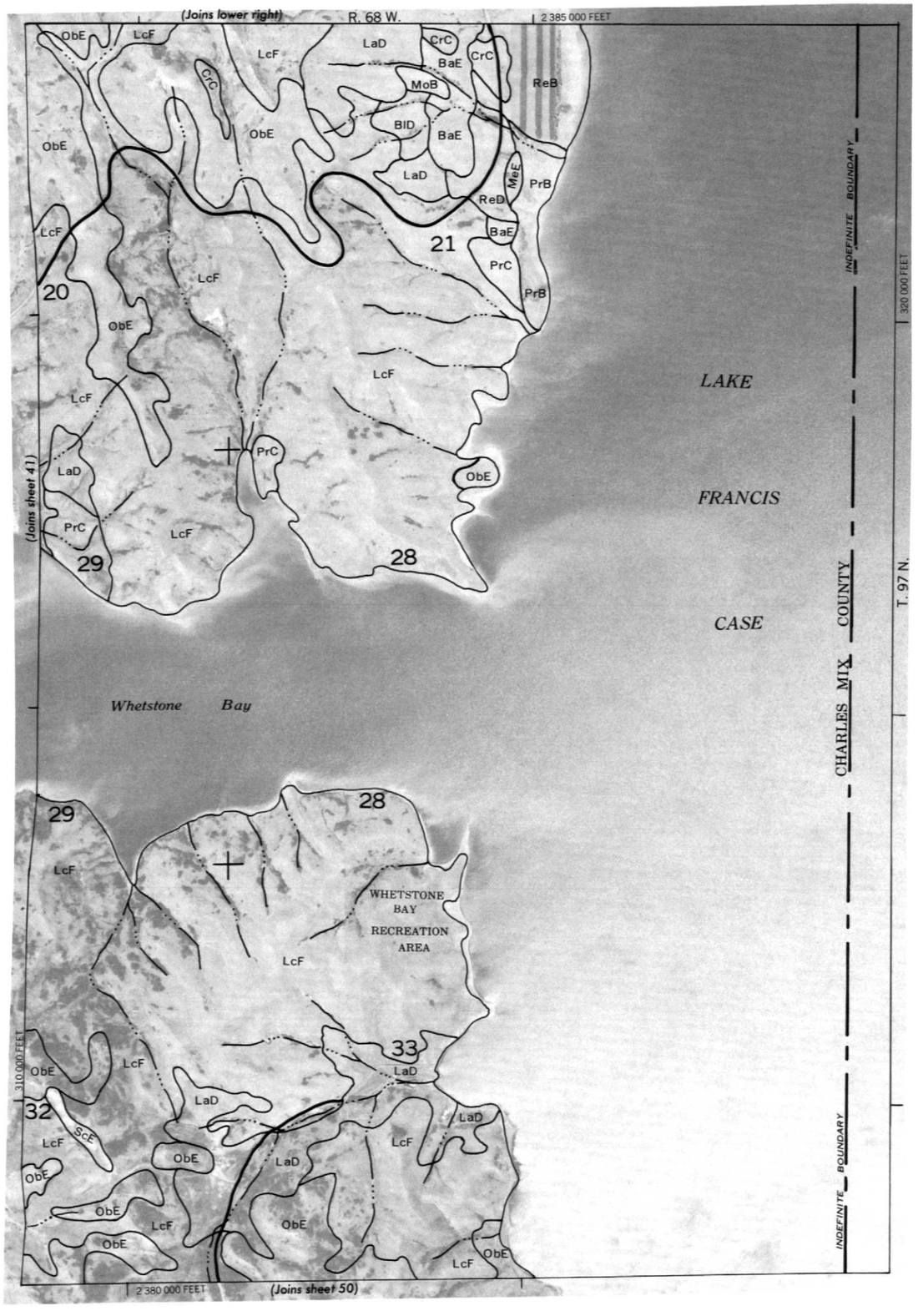
Whetstone Creek

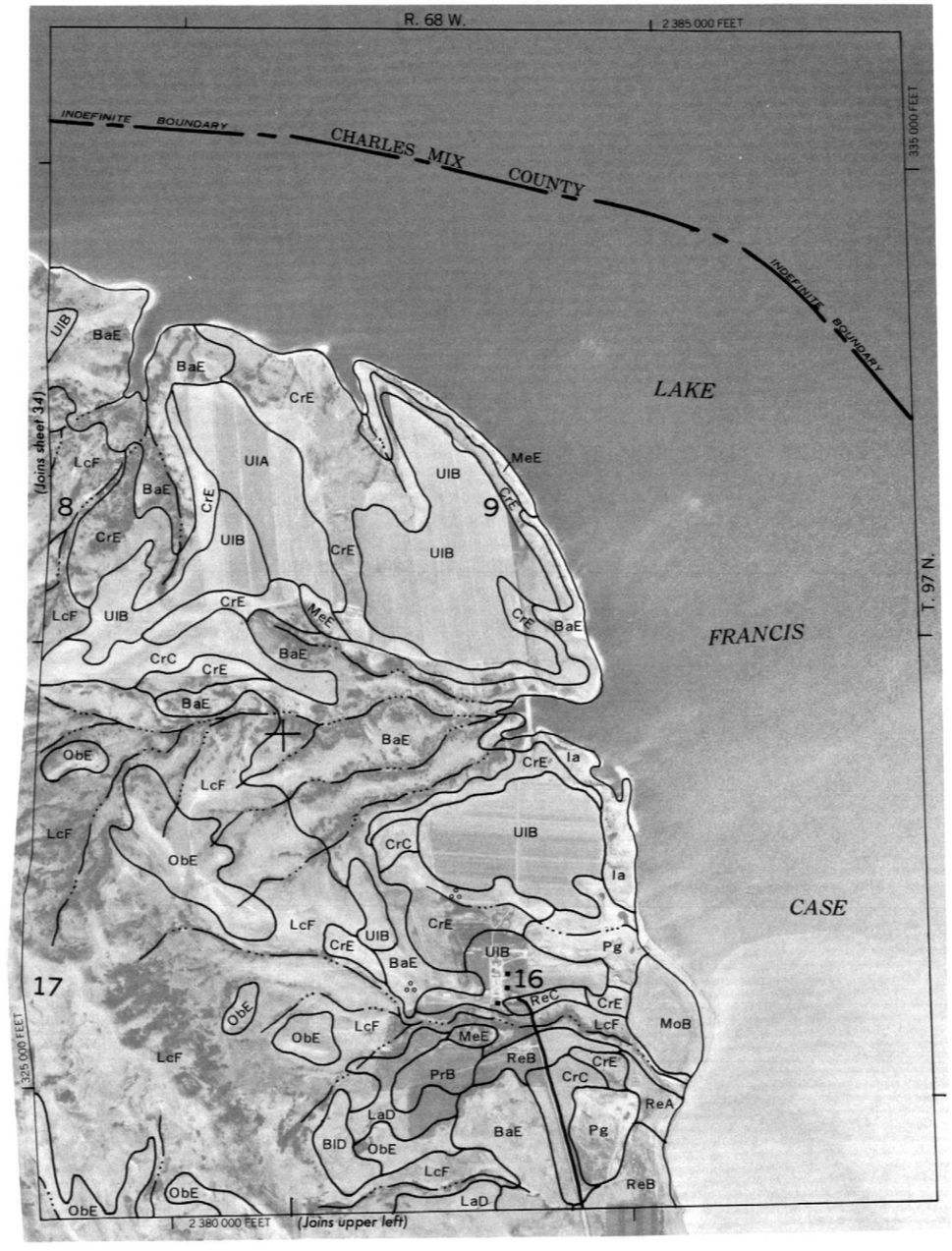
23 24 25 26 19 20 21 30 29 28 35 36 31 32 33

LcF ObE LaD BID PrB PrC LoD Wd We PrA Bb MeC OcF CaA RaC MoC MpC BmC

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



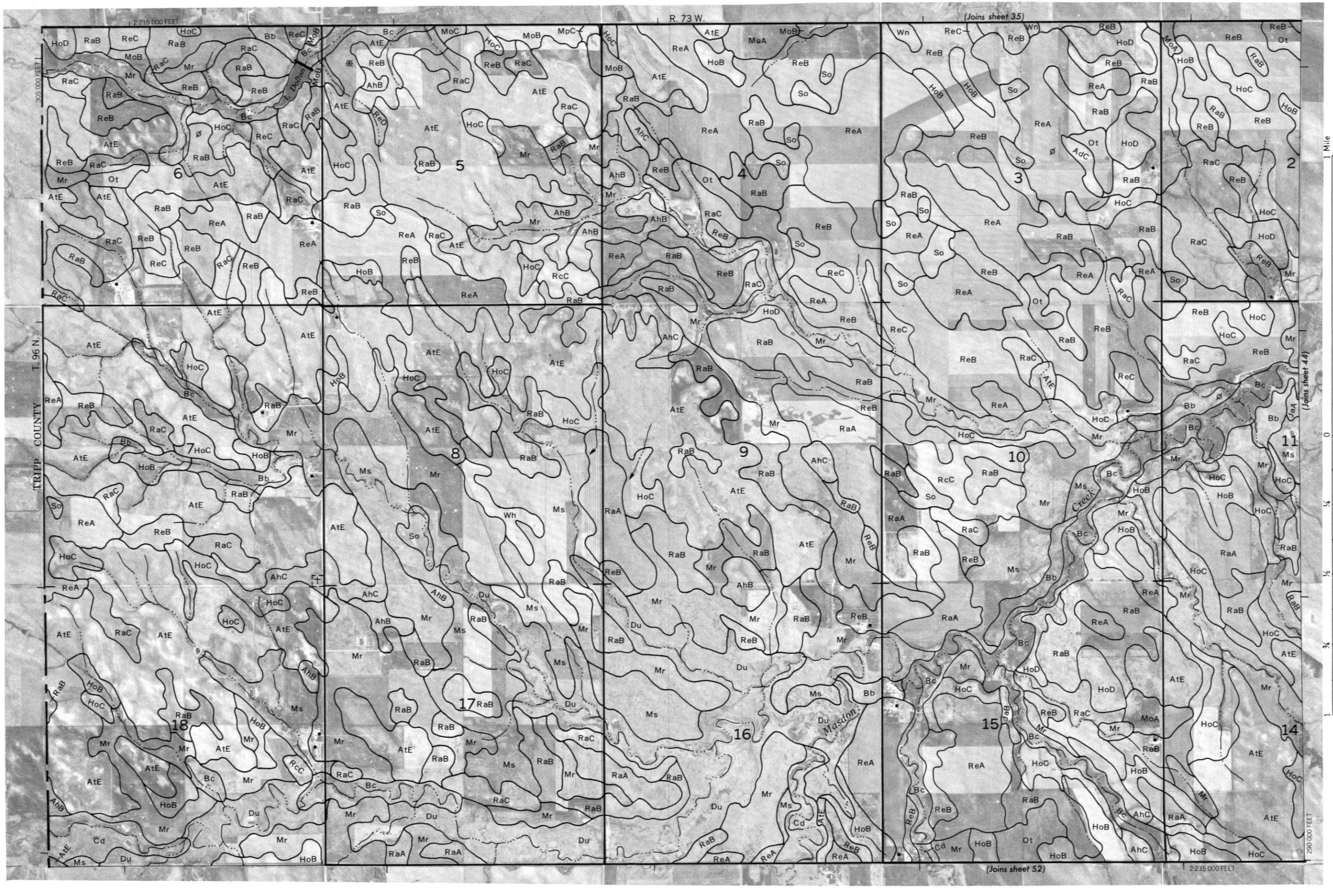




Scale 1:20000

1 Mile 5 000 Feet 1000 2000 3000 4000 5000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

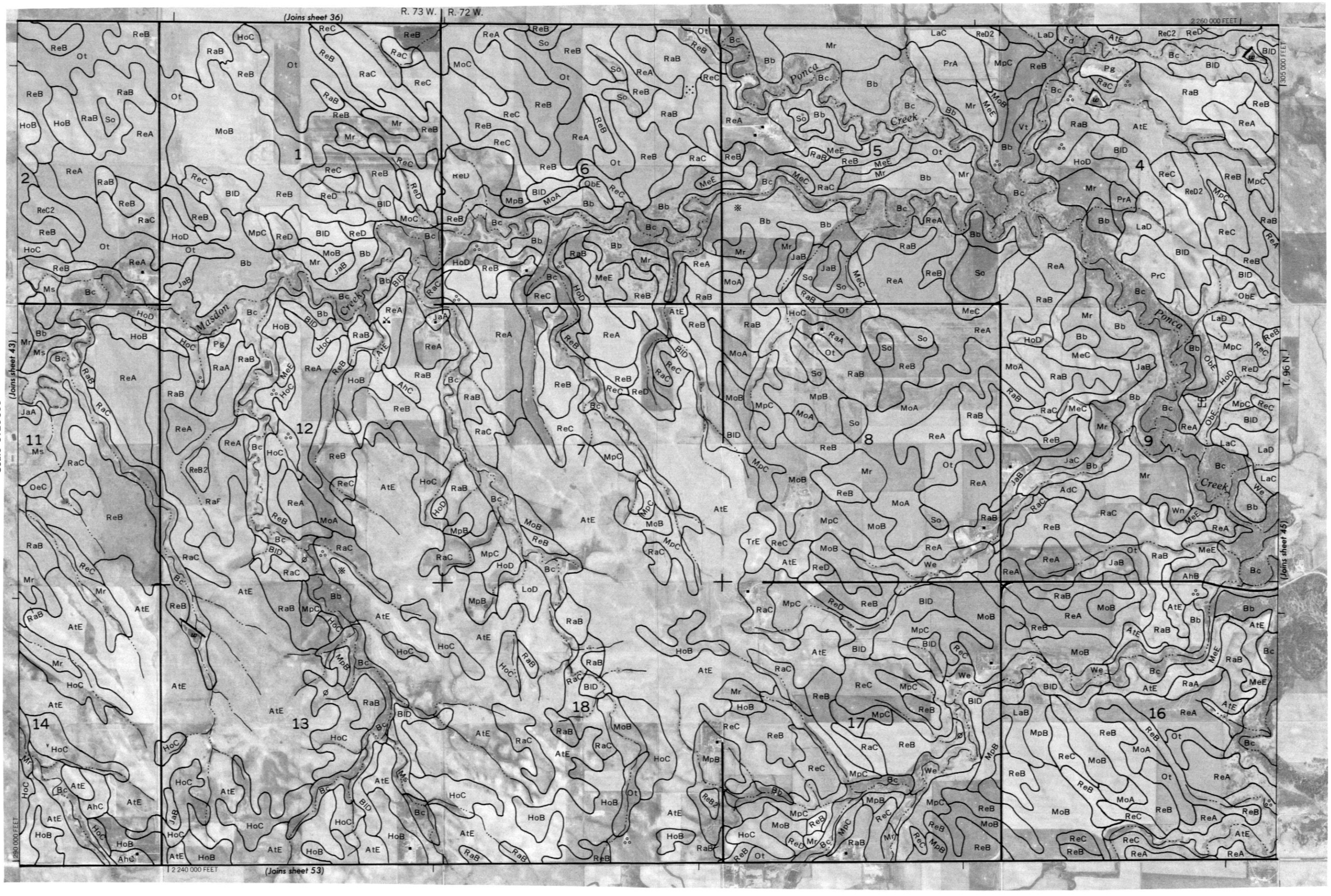


N

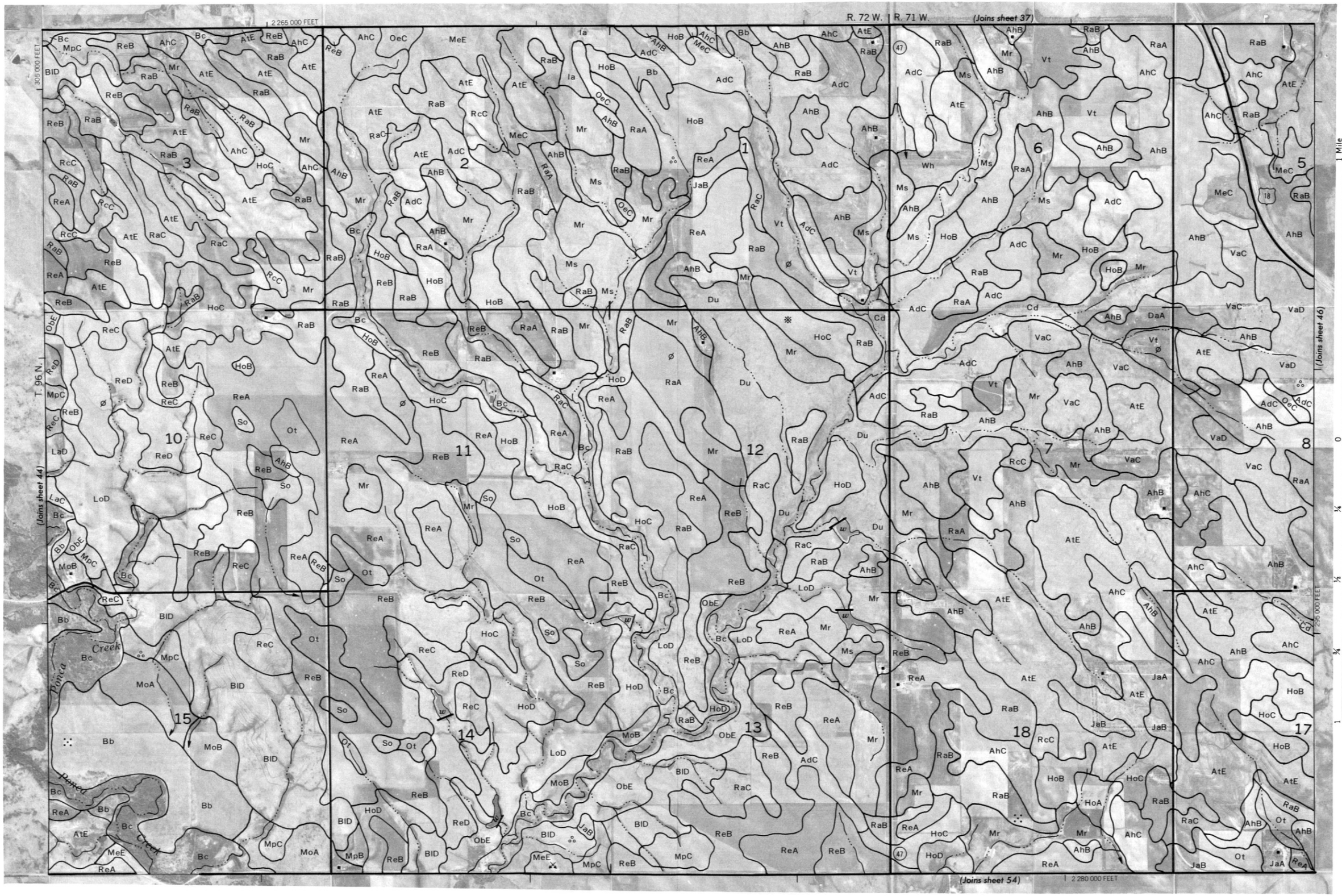
Scale 1:20000

1 Mile 5000 Feet

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



46

N

1 Mile
5000 Feet

Scale 1:20000

(Joins sheet 38)

R. 71 W.

2 305 000 FEET

305 000 FEET

T. 96 N.

(Joins sheet 45)

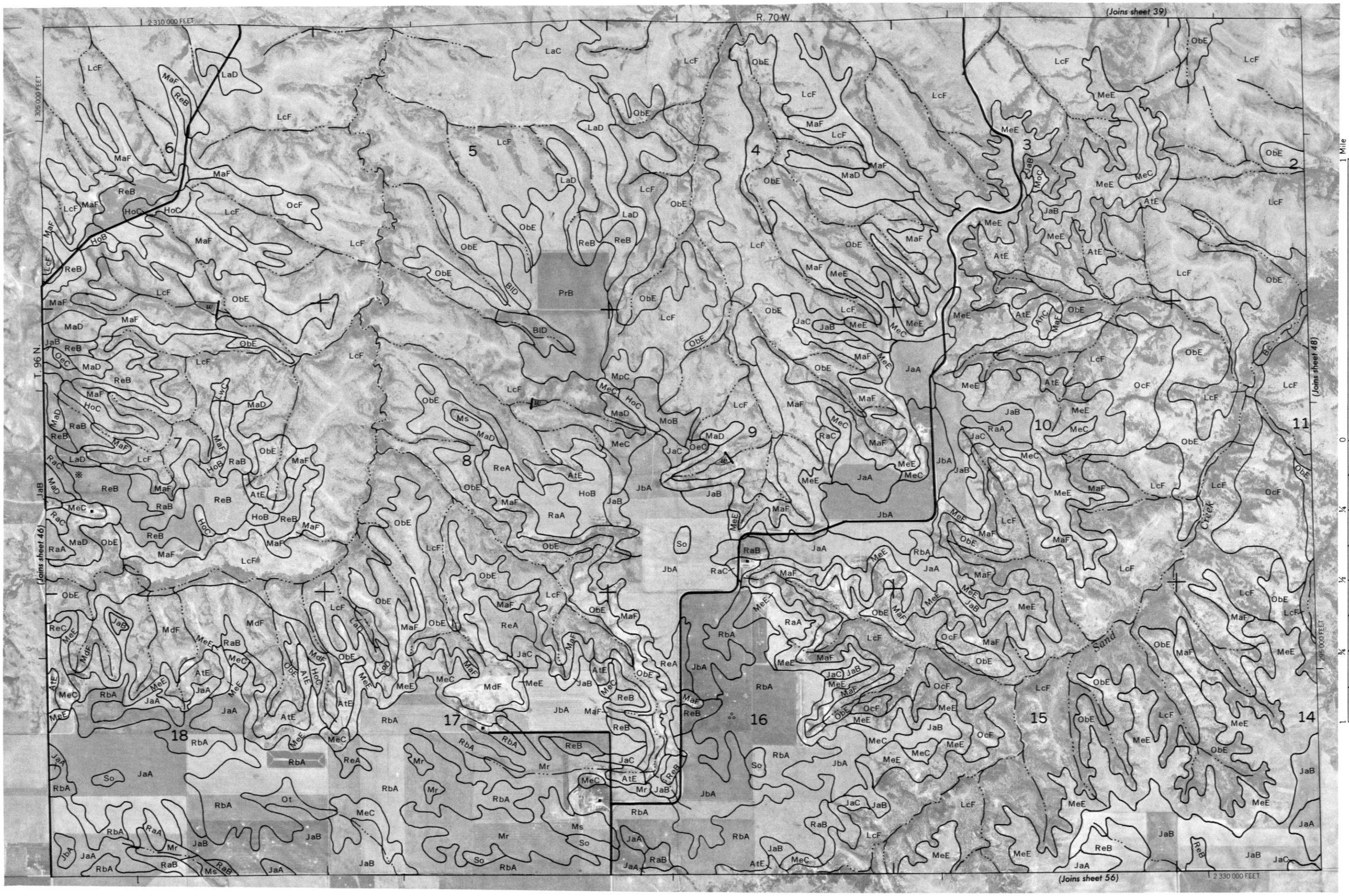
(Joins sheet 47)

2 285 000 FEET

295 000 FEET

(Joins sheet 55)

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



(48)

N

R. 70 W. | R. 69 W.

T. 96 N.

(Joins sheet 40)

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 57)

2 355 000 FEET

305 000 FEET

2 335 000 FEET

Scale 1:20000

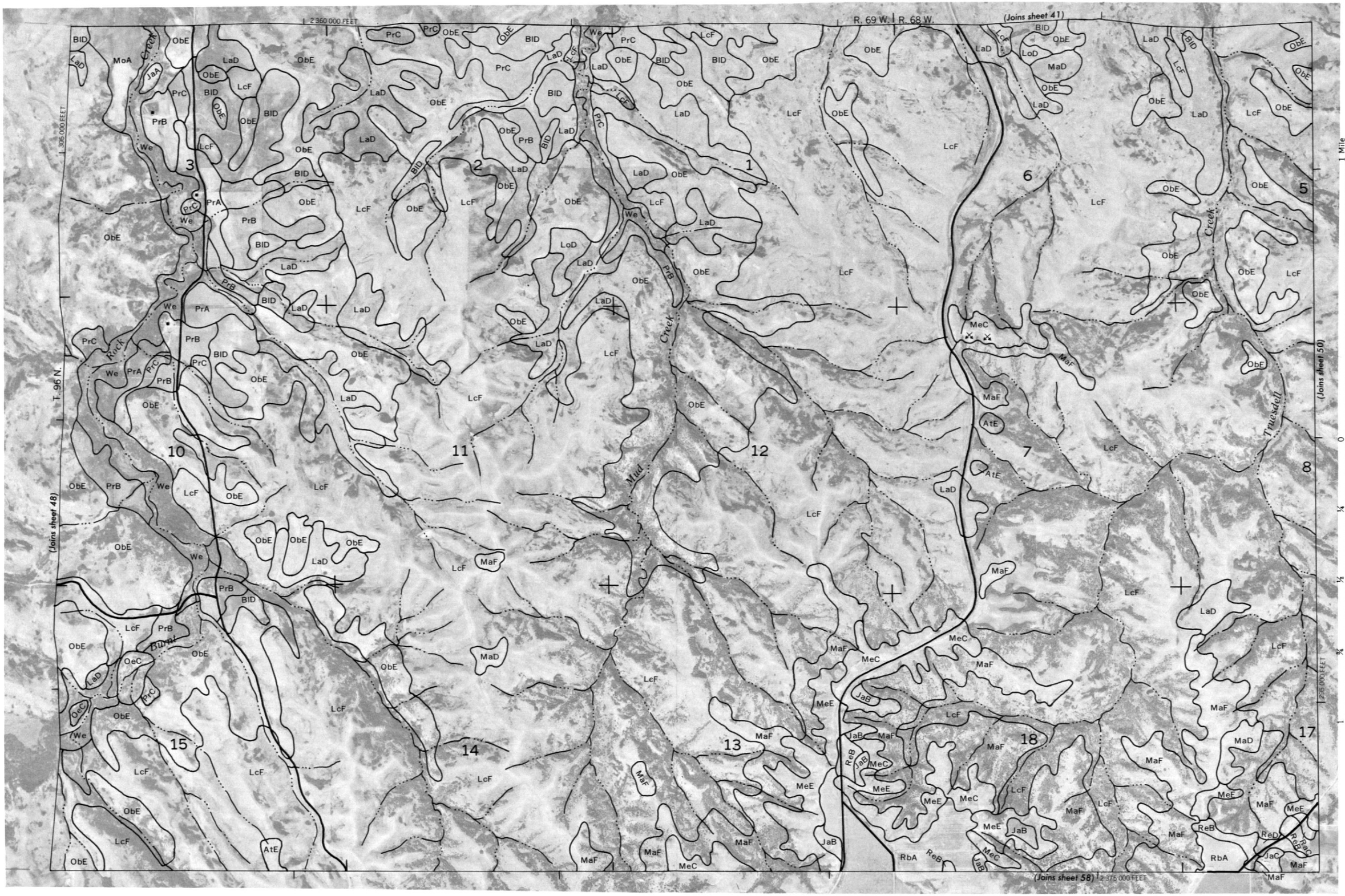
1 Mile

5000 Feet

Sandy Creek

Burnt Rock Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



50

N

R. 68 W.

(Joins sheet 42)

(Joins sheet 49)

(Joins sheet 59)

(Joins sheet 51)

T. 96 N.

2 400 000 FEET

305 000 FEET

295 000 FEET

2 380 000 FEET

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

INDEFINITE BOUNDARY

LAKE

FRANCIS

CASE

Odenbach

Bay

North Scalp Creek

1 Mile

5000 Feet

Scale · 1 : 20000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

1¼ 5000

ObE LcF LaD PrB MpC We ReB So ReA Ot MoB MaF MeE MeC UlB CrE CrC PrC

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This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

2 405 000 FEET

R. 67 W.

305 000 FEET

R. 65 W.

2 475 000 FEET

267 000 FEET

FORT RANDALL DAM

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

T. 96 N.

T. 95 N.

LAKE

FRANCIS CASE

Wd

LcF

UlB

ObE

LaD

MoC

AaA

On

Ha

Ia

Rv

MaF

Randall Creek

RANDALL CREEK RECREATION AREA

MISSOURI RIVER

SOUTH WHEELER RECREATION AREA

35

17

16

18

7

8

(Joins sheet 60)

(Joins sheet 70)

(Joins sheet 71)

(Joins sheet 83)

(Joins sheet 50)

2 480 000 FEET

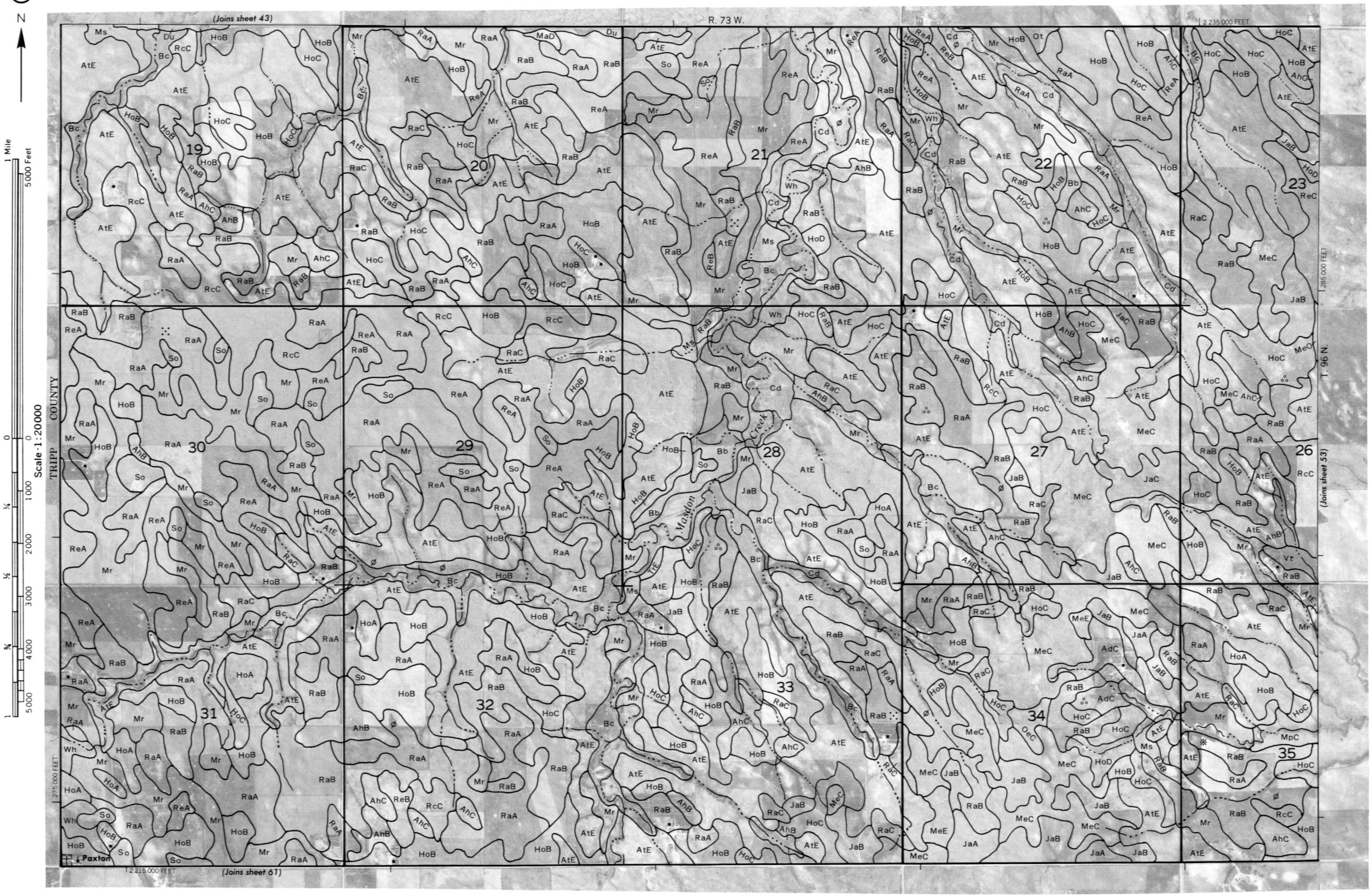
2 425 000 FEET

4000 AND 5000-FOOT GRID TICKS

1 Mile

5000 Feet

Scale 1:20000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

R. 73 W. | R. 72 W.

2 240 000 FEET

285 000 FEET

T. 96 N.

(Joins sheet 44)

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 62)

2 260 000 FEET

275 000 FEET

53

N

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 54

N

R. 72 W. R. 71 W.

2 280 000 FEET

280 000 FEET

T. 96 N.

(Joins sheet 45)

(Joins sheet 53)

(Joins sheet 55)

(Joins sheet 63)

2 265 000 FEET

275 000 FEET

Scale 1 : 20000

1 Mile 5000 Feet

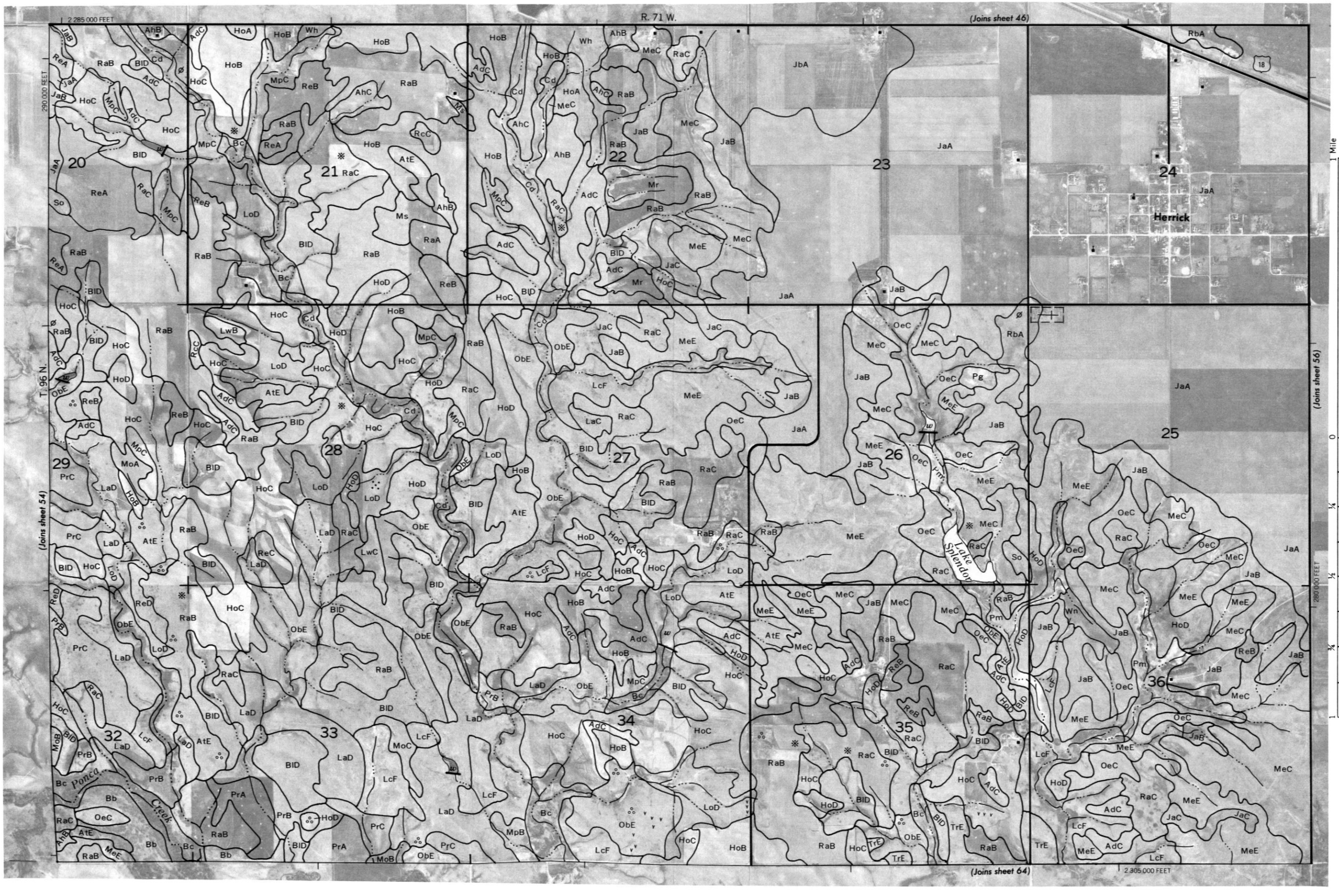
0 1000 2000 3000 4000 5000

1/4 1/2 3/4 1

Ponca Creek

Murphy Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



56

N

1 Mile
5 000 Feet
Scale · 1 : 20000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

(Joins sheet 47)

R. 70 W.

2 330 000 FEET

290 000 FEET

280 000 FEET

T. 96 N.

(Joins sheet 55)

(Joins sheet 57)

(Joins sheet 65)

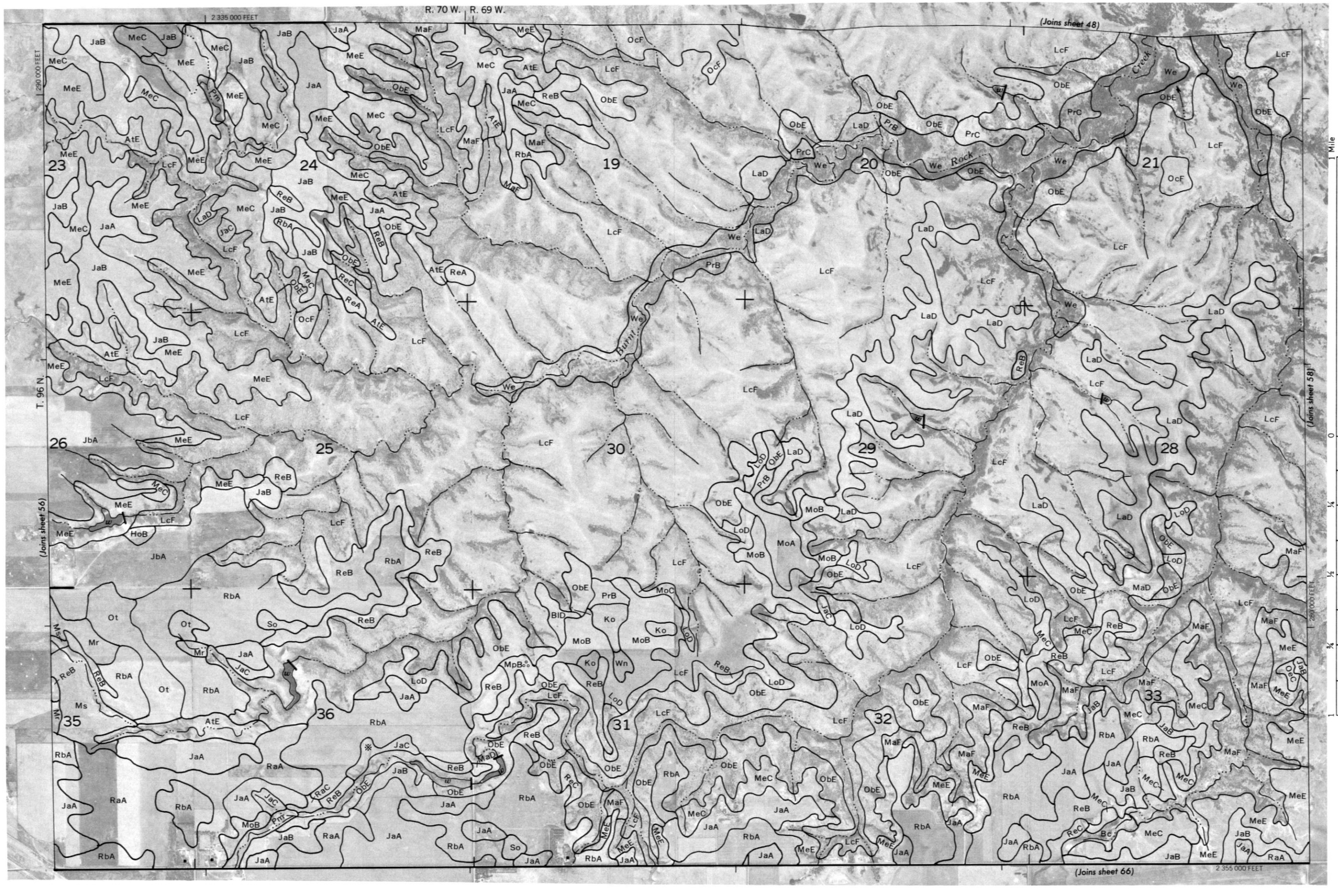
2 310 000 FEET

St. Charles

Lake Berry

Willow Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



58

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 58

N

Scale · 1 : 20000

1 Mile

5000 Feet

(Joins sheet 49)

(Joins sheet 57)

(Joins sheet 67)

(Joins sheet 59)

R. 69 W.

R. 68 W.

T. 96 N.

2 375 000 FEET

2 360 000 FEET

280 000 FEET

DEVILS GRAVE HILL

22 23 24 19 20

27 26 25 30 29

34 35 36 31 32

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 59

59

N

2 380 000 FEET

R. 68 W.

(Joins sheet 50)

290 000 FEET

T. 96 N.

(Joins sheet 58)

(Joins sheet 60)

(Joins sheet 68)

2 400 000 FEET

280 000 FEET

Scale 1:20000

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

Creek

Scalp

North

20 21 22 23 24 25 26 27 28 29 32 33 34 35 36

MaF MaD MoA MoC ReC ReA ReB RaC RaB AtE BlD HoD HoC MeE LcF ObE PrB PrC LaD LaB LaC MoB Bc We LoD UlB CrC OcF

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
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N

1 Mile 5000 Feet

0 0

Scale 1 : 20000

¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

(Joins sheet 51)

R. 67 W.

2 425 000 FEET

290 000 FEET

T. 96 N.

INDEFINITE BOUNDARY CHARLES MIX COUNTY

LAKE

FRANCIS

CASE

SOUTH SCALP CREEK RECREATION AREA

Scalp Cr

South Scalp Cr

19 20 21 22 27 28 29 30 31 32 33 34 35 26

(Joins sheet 59)

(Joins inset, sheet 51)

2 405 000 FEET

(Joins sheet 69)

UlB MaF LcF Ot CrC CrE ReD OcF ObE LaD PrC PrA PrB We BlD LoD AaA AaB So TrE

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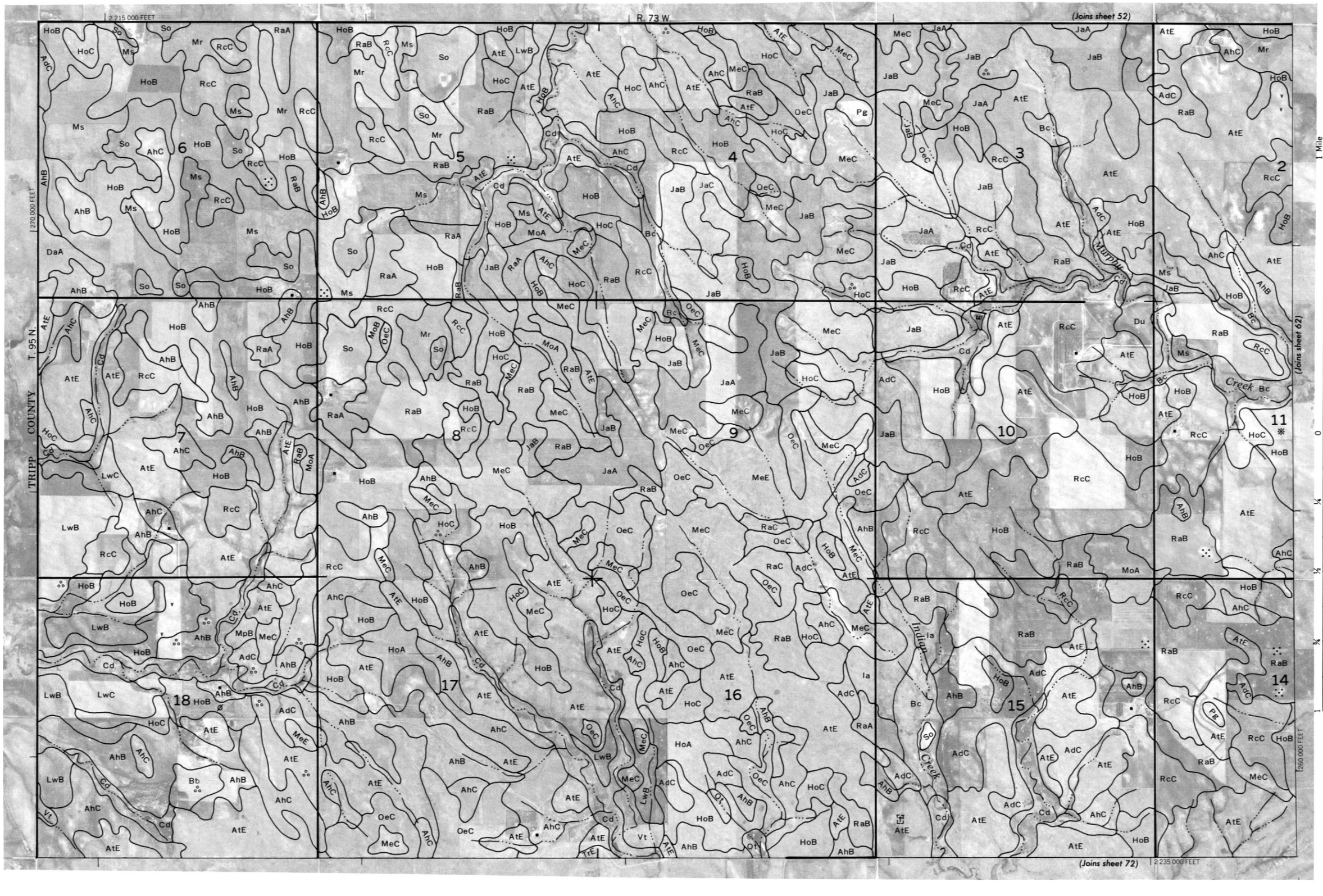
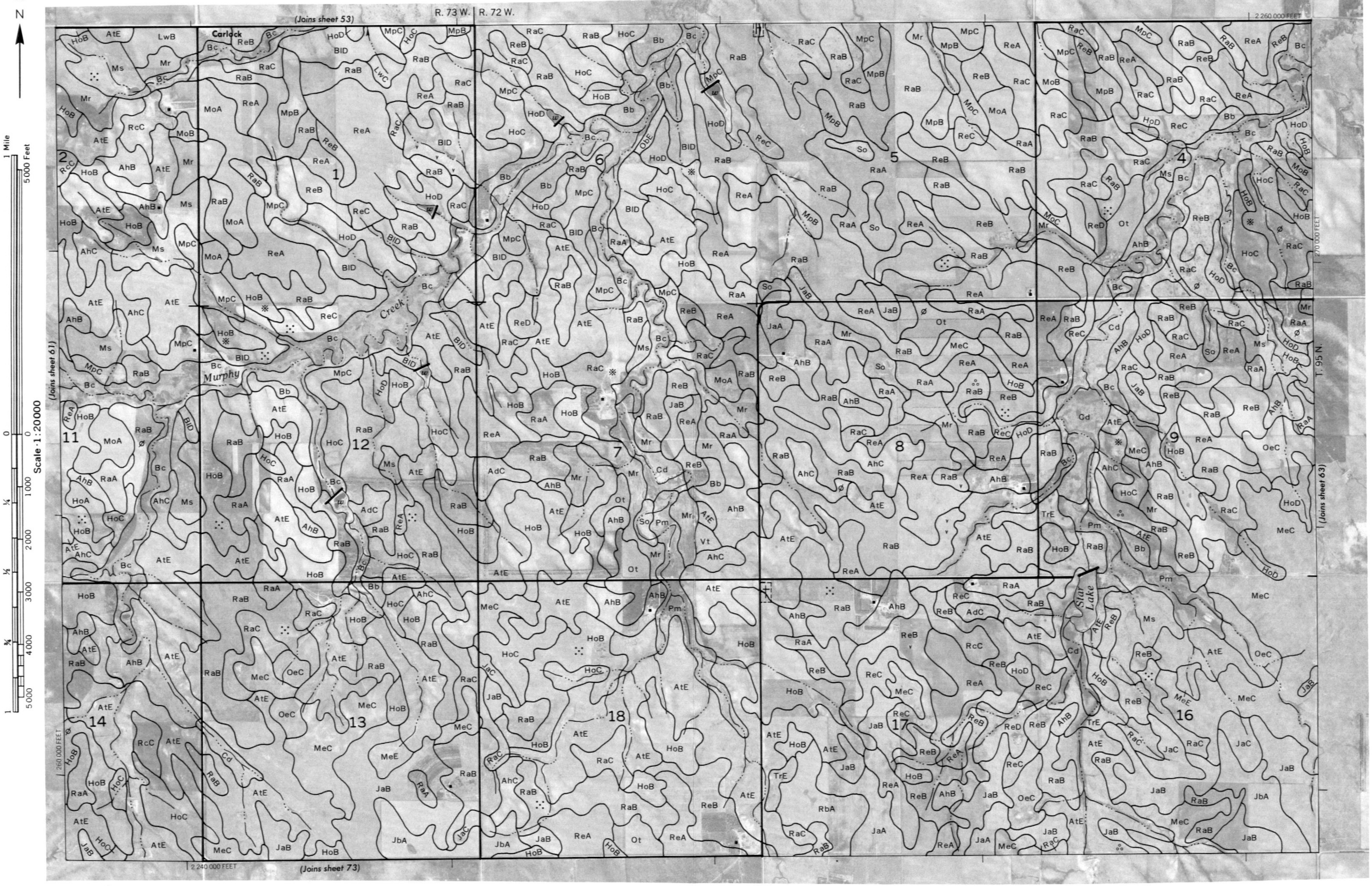
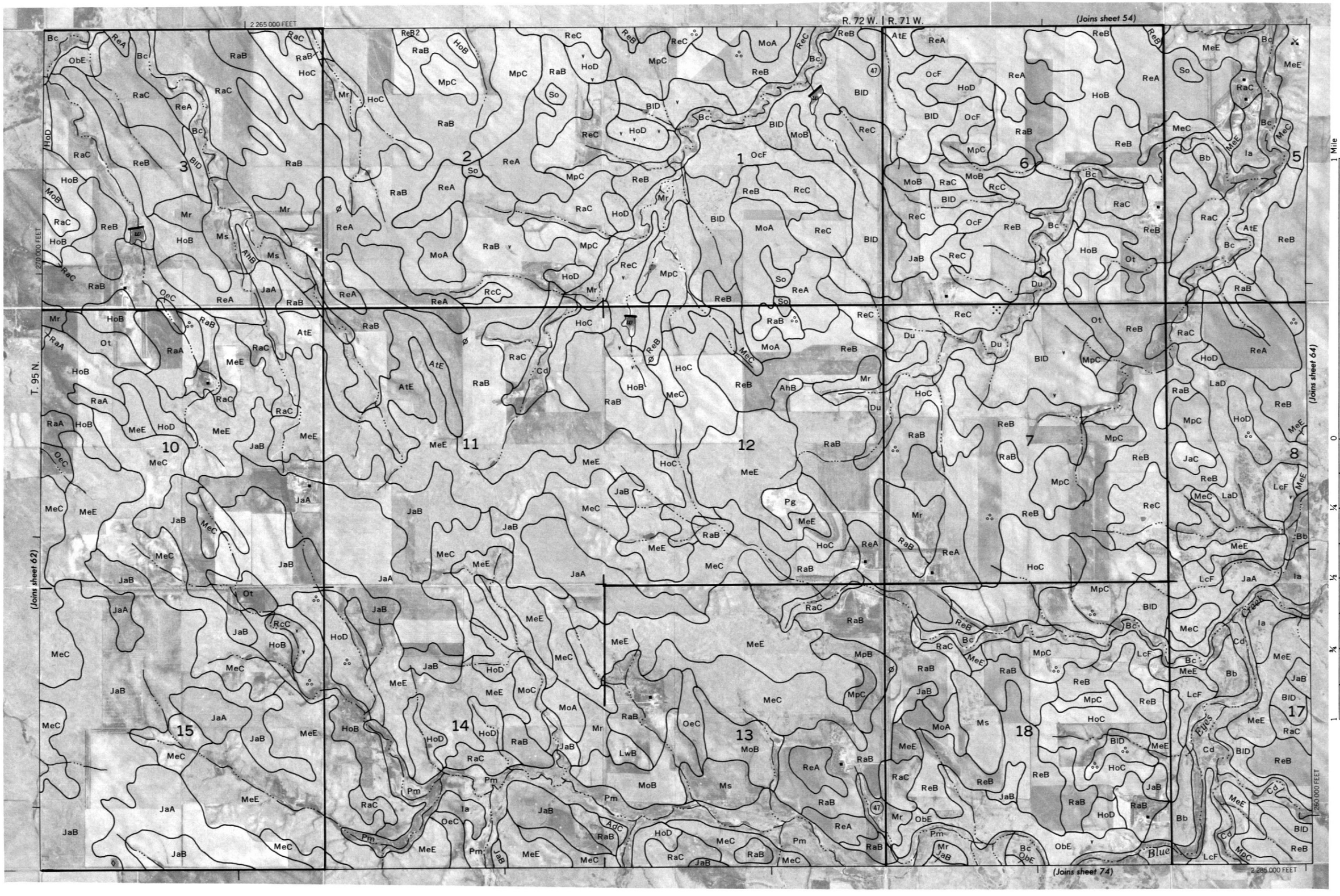
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



64

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 64

N

Scale 1:20000

1 Mile 5000 Feet

0 0 ¼ ½ ¾ 1

1000 2000 3000 4000 5000

(Joins sheet 55)

R. 71 W.

2 305 000 FEET

215 000 FEET

T. 95 N.

(Joins sheet 63)

(Joins sheet 65)

(Joins sheet 75)

2 290 000 FEET

260 000 FEET

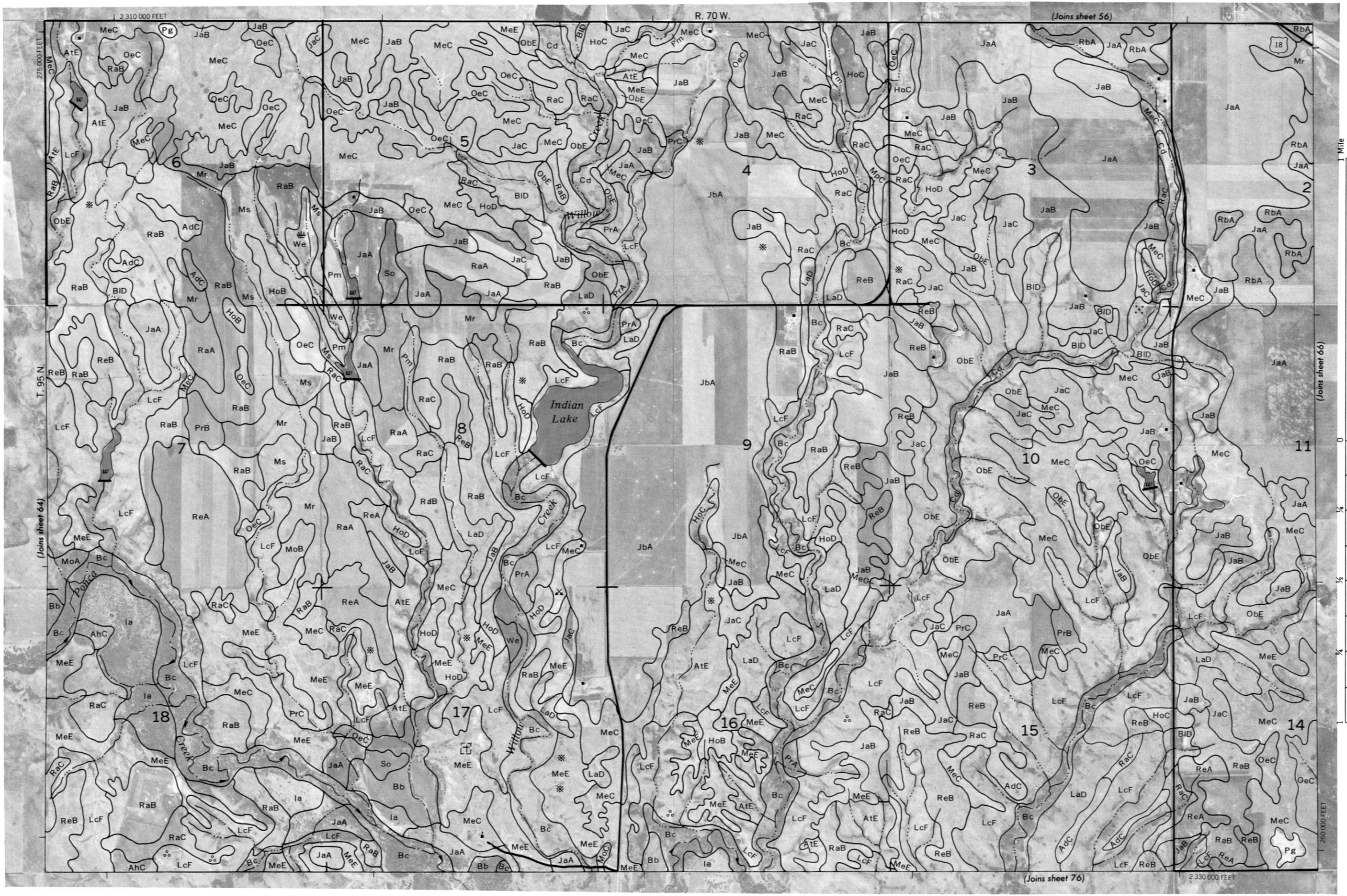
Blue Creek

Ponca Creek

Bull Creek

Hay Creek

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 66

N

R. 70 W. | R. 69 W.

T. 95 N.

(Joins sheet 57)

(Joins sheet 65)

(Joins sheet 67)

(Joins sheet 77)

2 355 000 FEET

275 000 FEET

260 000 FEET

2 335 000 FEET

1 Mile

5000 Feet

Scale 1:20000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 67

67

R. 69 W. | R. 68 W.

(Joins sheet 58)

T. 95 N.

(Joins sheet 66)

(Joins sheet 68)

(Joins sheet 78)

2 360 000 FEET

275 000 FEET

2 375 000 FEET

265 000 FEET

Bonesteel

Houston Springs

N

1 Mile

5 000 Feet

Scale 1:20000

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 Mile
5000 Feet
Scale 1:20000
1 0 ¼ 0 ½ 1000 ¾ 2000 1 3000 1¼ 4000 1½ 5000

(Joins sheet 59)

R. 68 W.

2 400 000 FEET

276 000 FEET

T. 95 N.

265 000 FEET

2 380 000 FEET

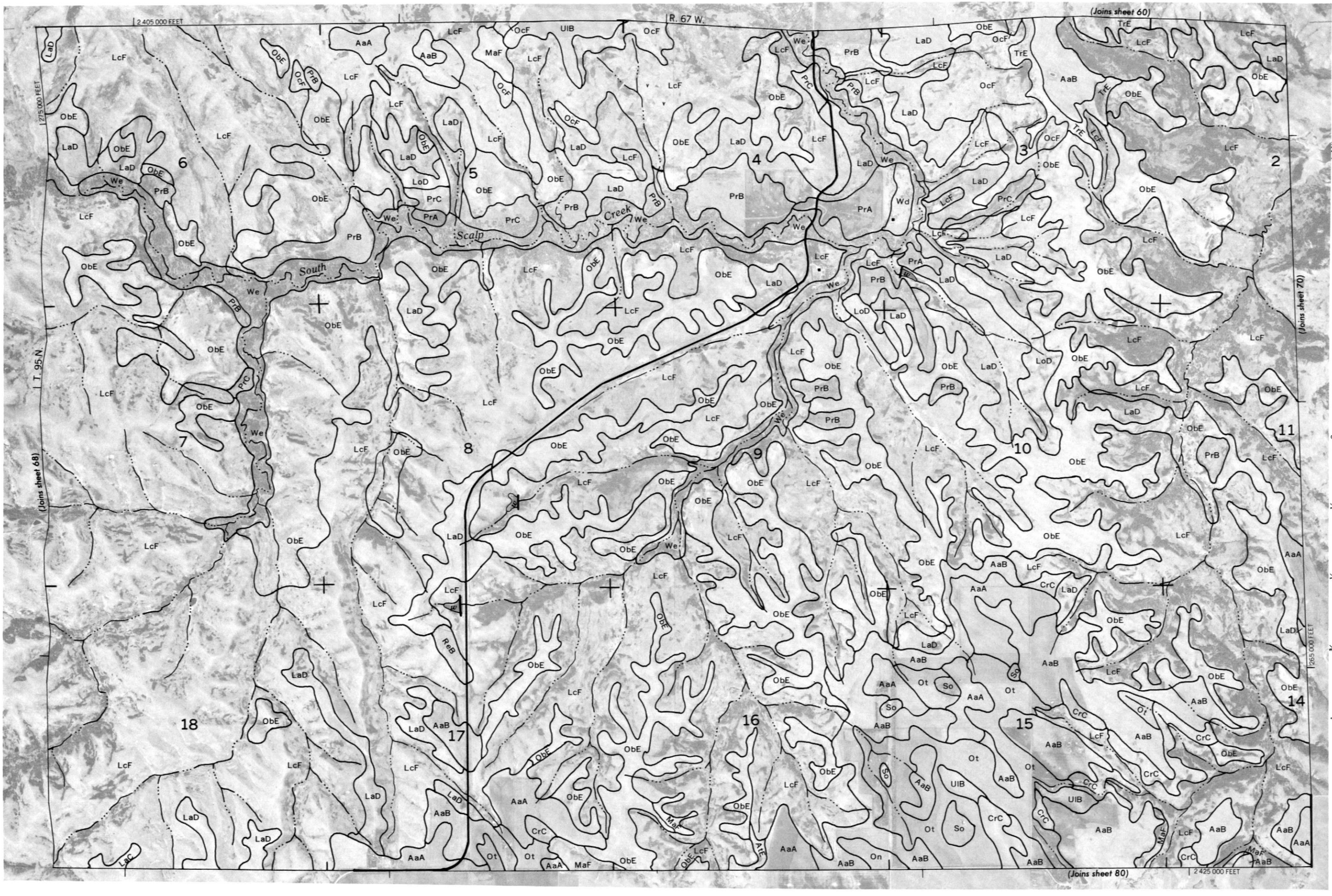
(Joins sheet 67)

(Joins sheet 79)

(Joins sheet 69)

South Scalp Creek

Fairfax Lake



N

Scale · 1 : 20000

1 Mile 0 ¼ ½ ¾ 1

5000 Feet 0 1000 2000 3000 4000 5000

R. 67 W. | R. 66 W.

2 450 000 FEET

275 000 FEET

265 000 FEET

2 430 000 FEET

(Joins inset, sheet 51)

(Joins sheet 69)

(Joins sheet 71)

(Joins sheet 81)

LAKE

FRANCIS

CASE

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

INDEFINITE BOUNDARY

Joe Days Bay

Joe Days Creek

18 281

T. 95 N.

ObE LcF LaD We HoB UlB Ot MaF AaA AaB CrC CrE So UlA

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

71

N

2 455 000 FEET

R. 66 W. | R. 65 W.

275 000 FEET

T. 95 N.

INDEFINITE BOUNDARY

CHARLES MIX COUNTY

LAKE

FRANCIS CASE

INDEFINITE BOUNDARY

(Joins sheet 70)

SOUTH SHORE RECREATION AREA

SOUTH SHORE RECREATION AREA

Fort Randall Historic Site

FORT RANDALL DAM

Randall Creek

(Joins inset, sheet 51)

(Joins sheet 82)

2 470 000 FEET

265 000 FEET

10 11 12 13 14 15 17 18 8

LcF CrE CrC ObE UlB LaD MaF So Wd UlA MoA We ReC Ha MoB PrA AaA AaB

18 281

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

N

(Joins sheet 61)

R. 73 W.

2 235 000 FEET

255 000 FEET

T. 95 N.

(Joins sheet 73)

TRIPP COUNTY

KEYA PAHA COUNTY

NEBRASKA

2 215 000 FEET

245 000 FEET

Scale 1 : 20000

1 Mile 5 000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

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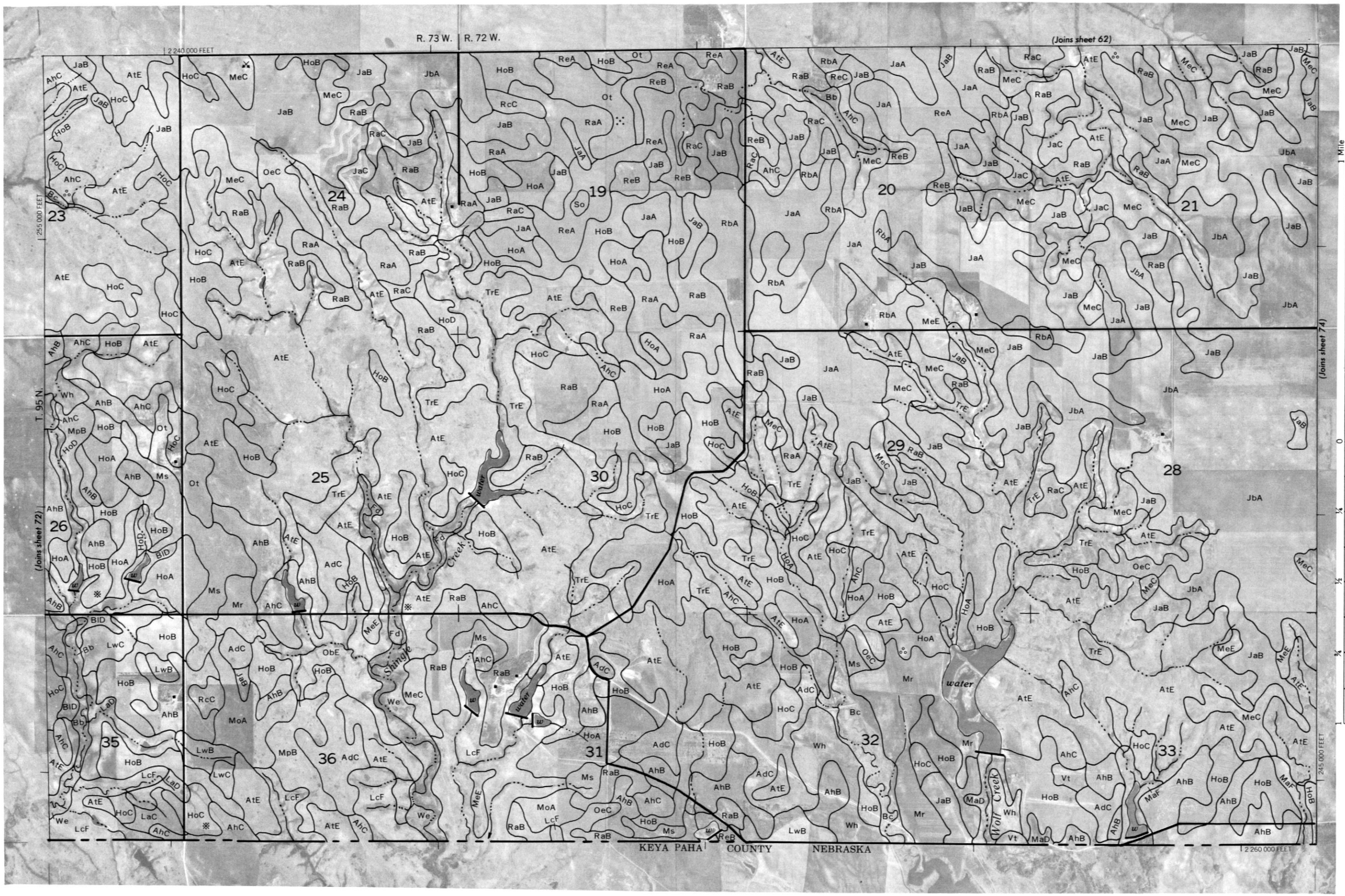
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 73



74

N

Scale · 1 : 20000

1 Mile 5000 Feet

0 0 ¼ ½ ¾ 1

1000 2000 3000 4000 5000

(Joins sheet 63)

(Joins sheet 73)

(Joins sheet 75)

R. 72 W. | R. 71 W.

T. 95 N.

2 285 000 FEET

2 275 000 FEET

2 265 000 FEET

2 245 000 FEET

KEYA PAHA COUNTY NEBRASKA

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 75

75

N

1 Mile

5,000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

¼ ½ ¾

2 290 000 FEET

2 305 000 FEET

245 000 FEET

255 000 FEET

R. 71 W.

T. 95 N.

(Joins sheet 64)

(Joins sheet 74)

(Joins sheet 76)

Creek

Hay

20 21 22 23 24 25 26 27 28 29 32 33 34 35 36

KEYA PAHA COUNTY NEBRASKA

BOYD COUNTY NEBRASKA

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(76)

N

1 Mile
5000 Feet
Scale 1:20000

(Joins sheet 65)

R. 70 W.

2 330 000 FEET

T. 95 N.

(Joins sheet 75)

(Joins sheet 77)

Milks Camp

Ponca Creek

Squaw Creek

water

XAVIER INDIAN MISSION

19 20 21 22 23
30 29 28 27 26
31 32 33 34 35

2 310 000 FEET

245 000 FEET

BOYD COUNTY, NEBRASKA

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 77

77

N

R. 70 W. | R. 69 W.

2 335 000 FEET

255 000 FEET

T. 95 N.

(Joins sheet 66)

(Joins sheet 76)

(Joins sheet 78)

water

Ponca Creek

Squaw Creek

Ponca Creek

Bc Creek

BOYD COUNTY | NEBRASKA

2 355 000 FEET

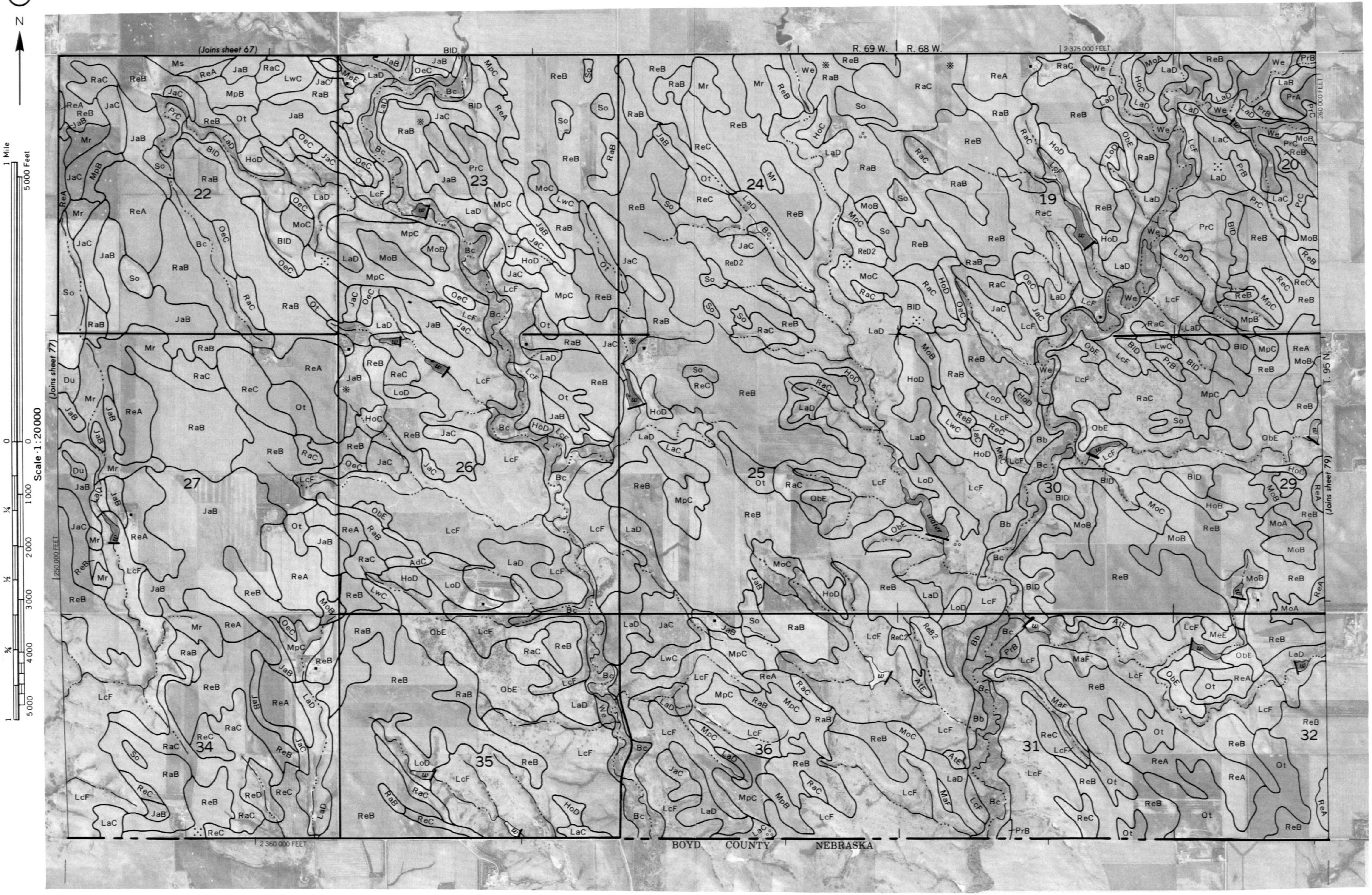
250 000 FEET

Scale · 1:20000

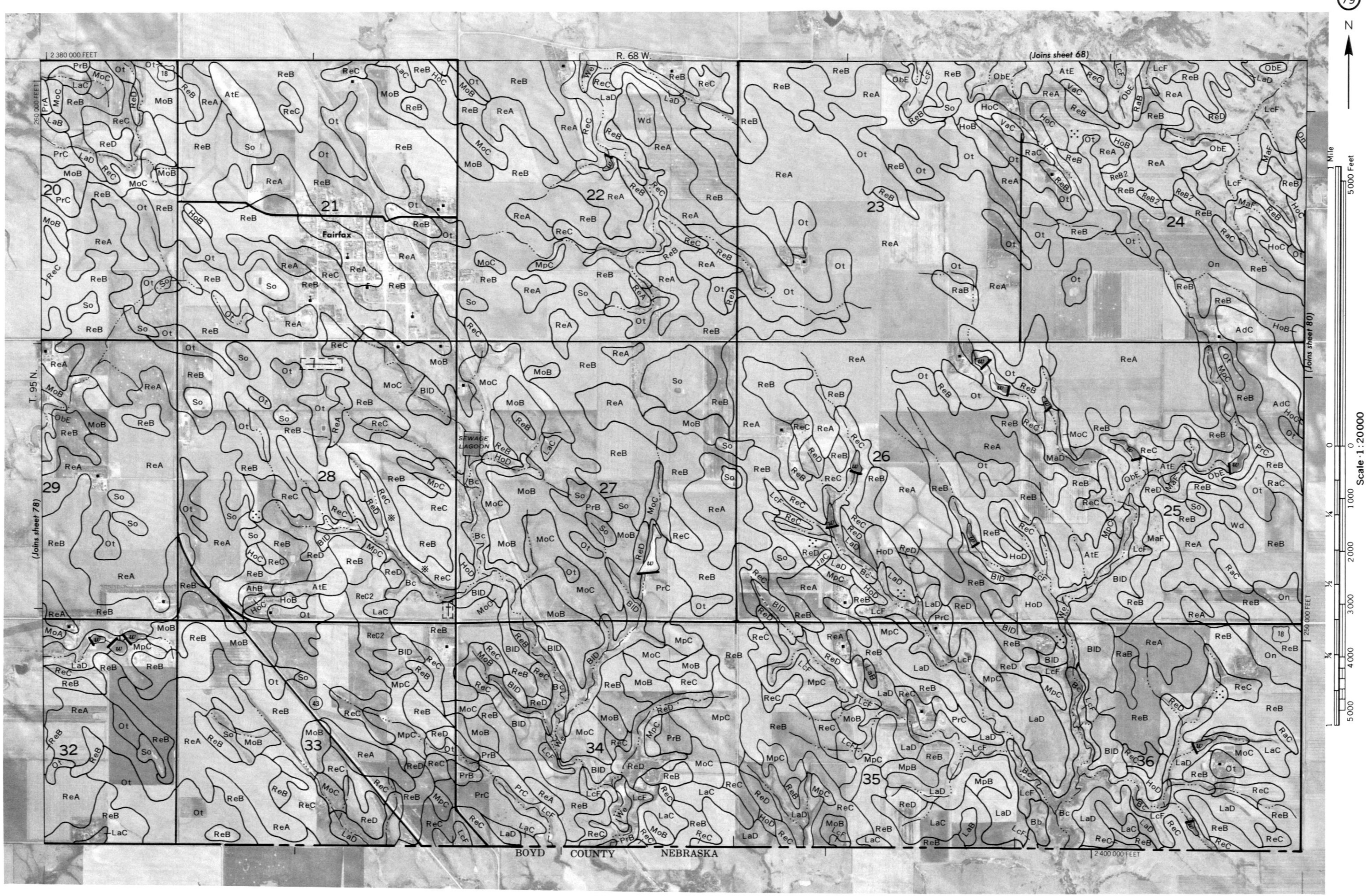
1 Mile

5000 Feet

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GREGORY COUNTY, SOUTH DAKOTA — SHEET NUMBER 80

80

N

Scale · 1:20000

1 Mile 5000 Feet

0 1000 2000 3000 4000 5000

R. 67 W.

T. 95 N.

(Joins sheet 69)

(Joins sheet 79)

(Joins sheet 81)

2 425 000 FEET

260 000 FEET

250 000 FEET

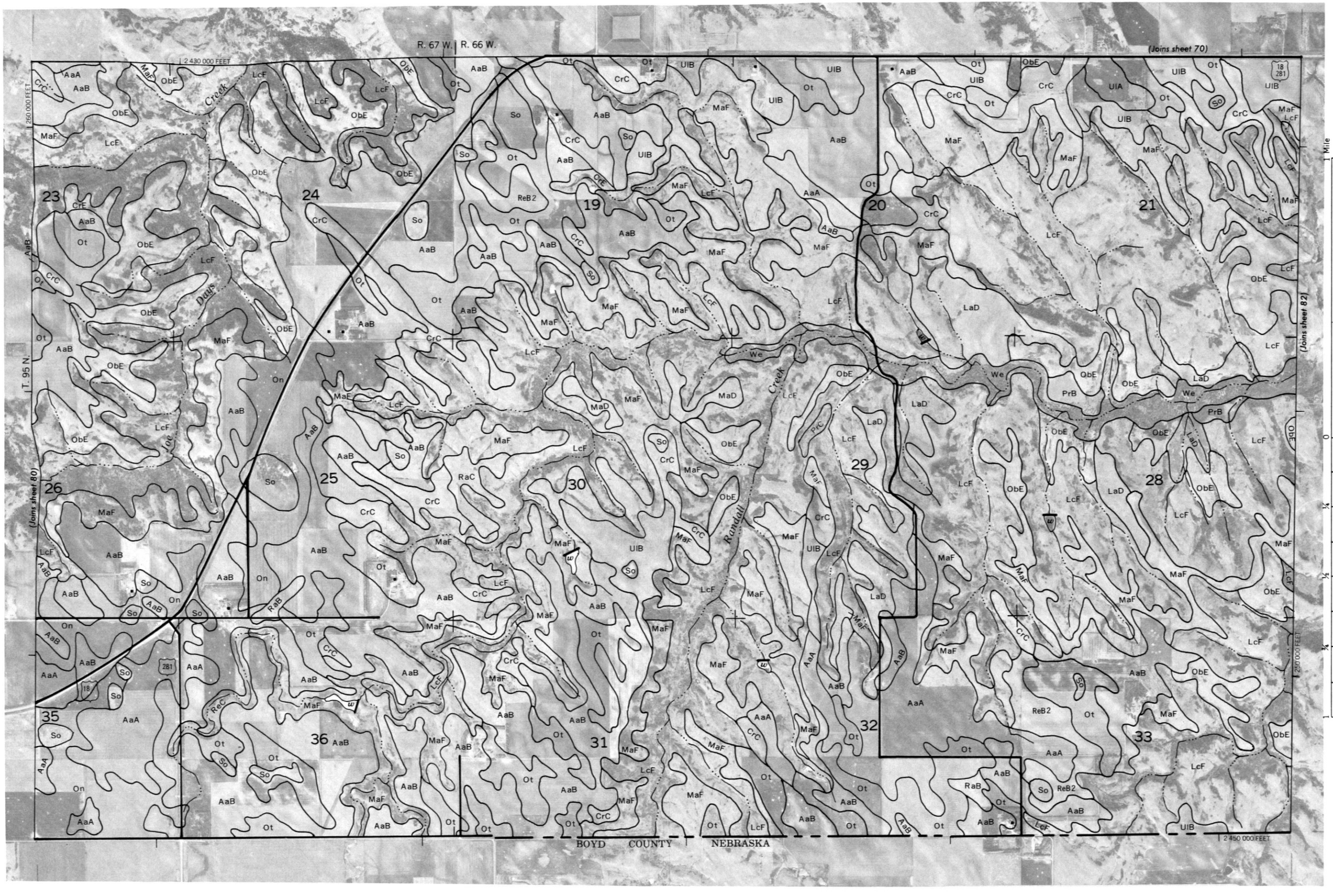
2 405 000 FEET

Tobacco Creek

Joe Days Creek

BOYD COUNTY NEBRASKA

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



82

N

1 Mile
5000 Feet
Scale 1:20000

(Joins sheet 71)

R. 66 W. | R. 65 W.

2 470 000 FEET

260 000 FEET

T. 95 N.

(Joins sheet 81)

(Joins sheet 83)

250 000 FEET

2 455 000 FEET

Fort Randall

Randall Creek

BOYD COUNTY NEBRASKA

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.